GAS

NOVEMBER 1960

Inside Russia—Gaswise

A CHILTON PUBLICATION

THE NATION'S NATURAL GAS AUTHORITY

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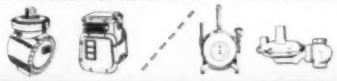

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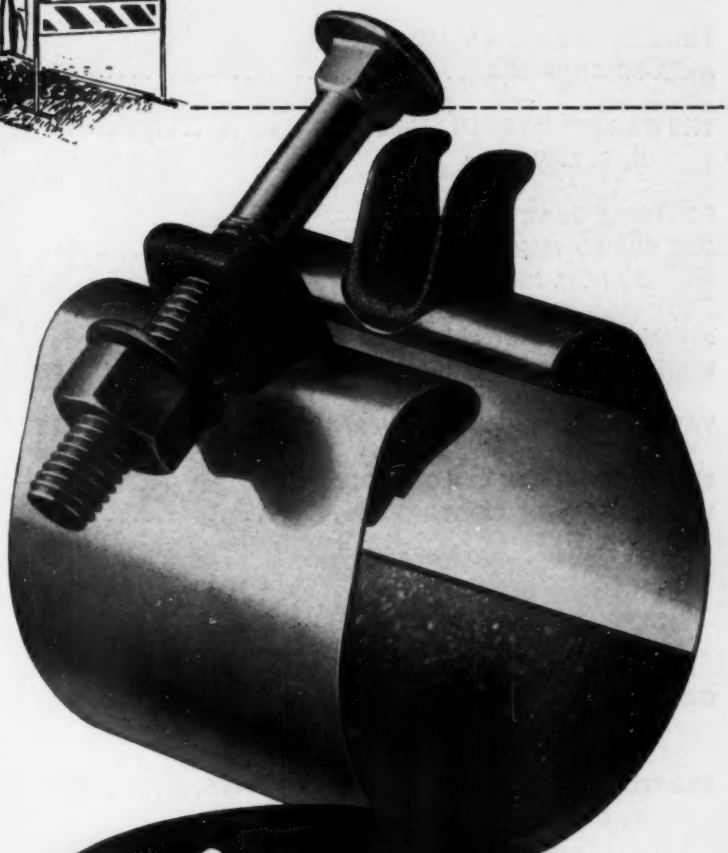

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36TH YEAR OF PUBLICATION

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BPA

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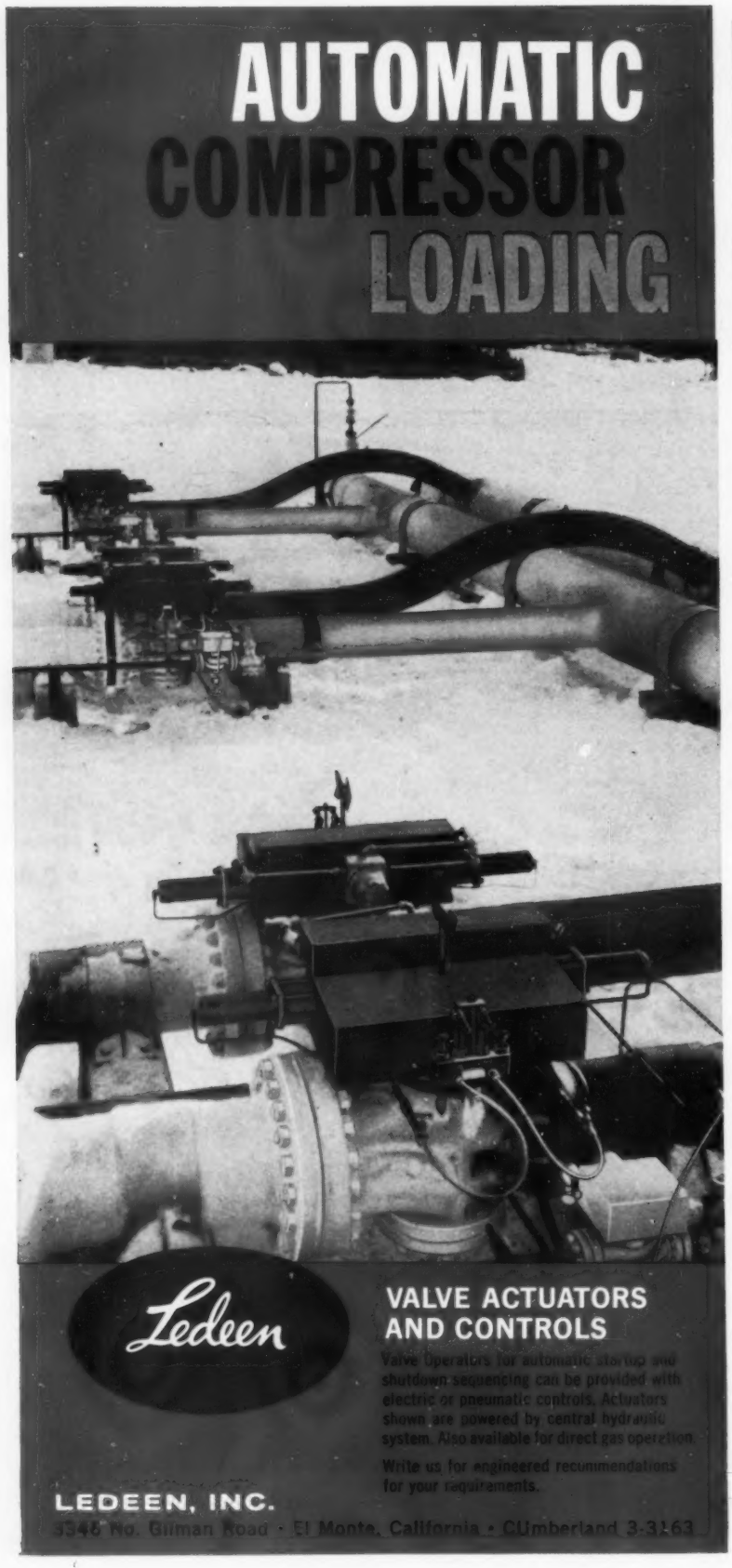
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CALENDAR

November

1..NEGA Operating Division—Statler Hilton, Hartford, Conn.

14-16..American Petroleum Institute Annual Meeting—Chicago.

15-16..Natural Gas Pipeline Institute—Court Room, Court House, Liberal, Kan.

December

5-9..AGA Gas Air Conditioning Sales School—Nationwide Inn, Columbus, Ohio.

1961

February

9-11..AGA Home Service Workshop — Cleveland - Sheraton Hotel, Cleveland, Ohio.

13-14..2nd Biennial Mid-Pacific Gas Merchandising Conference — Hawaiian Village Hotel, Honolulu.

March

13-17..National Association of Corrosion Engineers Annual Meeting Hotel Statler, Buffalo.

15-17..New England Gas Association Annual Meeting — Statler-Hilton Hotel, Boston.

20-22..AGA General Management Section Conference—Frances-Marion Hotel, Charleston, S. C.

27-29..Mid-West Gas Association Annual Meeting — Sheraton-Fontenelle Hotel, Omaha.

April

11-13..AGA Sales Conference on Industrial & Commercial Gas — Prince Edward, Windsor, Ont., Canada

13-15..GAMA Annual Meeting—Boca Raton, Fla.

18-20..Southwestern Gas Measurement Short Course — University of Oklahoma, North Campus, Norman, Okla.

24-26..Southern Gas Association Annual Meeting—New Orleans.

May

8-12..AGA Operating Section, Distribution & Production Conference, —Sheraton Hotel, Philadelphia.

15-17..AGA MidWest Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago

22-23..AGA Eastern Regional Gas Sales Conference — Pittsburgh Hilton Hotel, Pittsburgh

25-26..AGA Operating Section, Transmission Conference—Brown Palace and Cosmopolitan Hotel, Denver.

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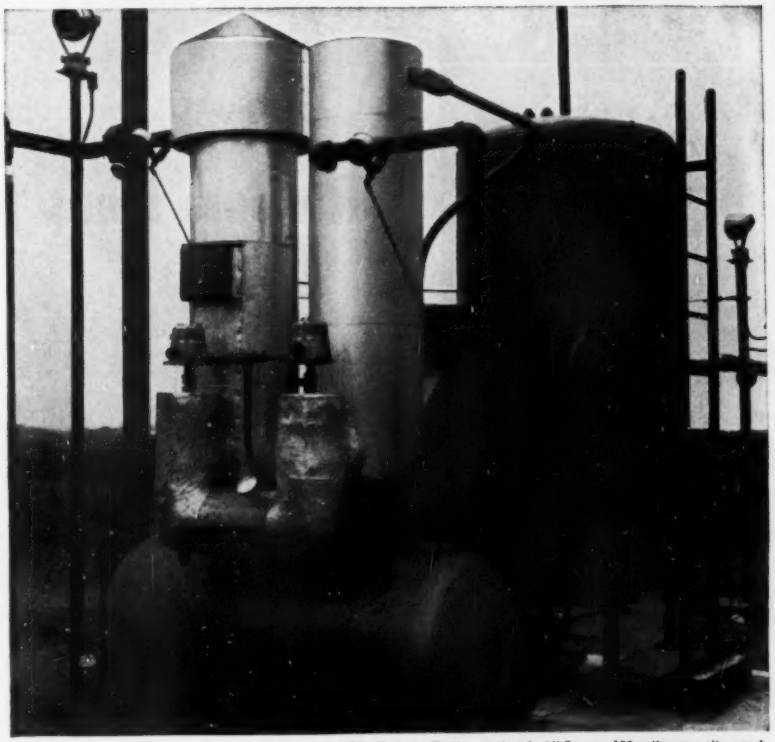

The Koppers-Baltimore electric Oil Fogger, 100 gallon capacity, newly installed at the East Rutherford Natural Gas Metering and Regulating station—the Public Service Electric and Gas Company, Newark, N. J.

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Thermally Thinking

NOVEMBER 1960

Random ideas from Atlantic City

ATLANTIC CITY was the place to be during October. There, the AGA annual convention and "Festival of Flame" dazzled the eyes of visitors and, I think, actually did the same thing to the eyes of some seasoned gas-industry convention campaigners.

It may well be that impressions will change over the months. They often have a modulation under the catalyst of age. But during the month of October, and certainly at the convention and exhibit, there was little other than all-out praise for the whole "show."

And this brings to mind a bit of amateurish philosophy that struck me during an early morning pace along the Boardwalk.

Seagulls gliding about overhead reminded me that the Wright brothers used to study the graceful, effortless flight of these birds. I think in 1903 they were able to just barely lift man from the sand.

In just a short period, then, man's research and industrial progress have carried him well beyond the flight characteristics of gulls and birdlife in general. One can now imagine the seagulls studying a Boeing 707 Jet airliner or a Lockheed F-104 jet fighter. They may wish to fly like man, now, where only a little while ago man wished he could fly like the birds.

In parallel, we saw a vast exhibit hall full of new gas appliances, new operating equipment, progress in research by the gas industry, and many new ideas in Atlantic City. Perhaps they might lull our industry into some complacency.

This must not happen. Though we can well feel we are "on top" of the energy picture as far as fast growth and progress are concerned, it does not follow that our industry will always maintain these dramatic factors.

Rather the contrary is true, I think. The danger is that a dynamic, fast-growing industry is a prime target for competitors, and, perhaps for the taxman and the several segments of government in general.

So, if I carried anything away from the convention and exhibit, it was the need to keep researching and progressing. And to increase both the total effort and efficiency of processes that produce this fabulous, fantastic gas industry's better appliances, improved equipment, and progressive ideas.

The momentum cannot be permitted to decay. It must be accelerated.

Another very striking idea advanced at the AGA originated, I think, in the nimble mind of W. R. Connole, former commissioner on the Federal Power Commission. He called for truly expert administration as a prime requisite for regulatory relief. Few would disagree with his statement that without truly expert administration, regulation will not work. And, these ideas apply to both the commissioners and their staff.

An experienced administrator knows how to delegate authority and work properly. He knows well the area of the industry or agency in which he works. In addition, he has catholic knowledge of the business community, economic conditions, and the place of this country in world economics.

Getting back to our industry's own climate, where can the real experts be found to fill the needs for commissioners and staff as they develop on the FPC or in state regulatory bodies, for that matter?

Connole agrees that many should come from the gas industry itself. There are many fine men holding key positions in our industry that would make very fine and, very importantly, really impartial regulatory administrators.

Such men wouldn't have to spend a year or two learning the gas business as well as the techniques and policies of Federal Power Commission regulatory life. They know the gas industry in the first place or they wouldn't be where they are. And they know the business of federal regulation because many of these people have spent almost as much time working toward and before the Federal Power Commission as have some of the FPC personnel.

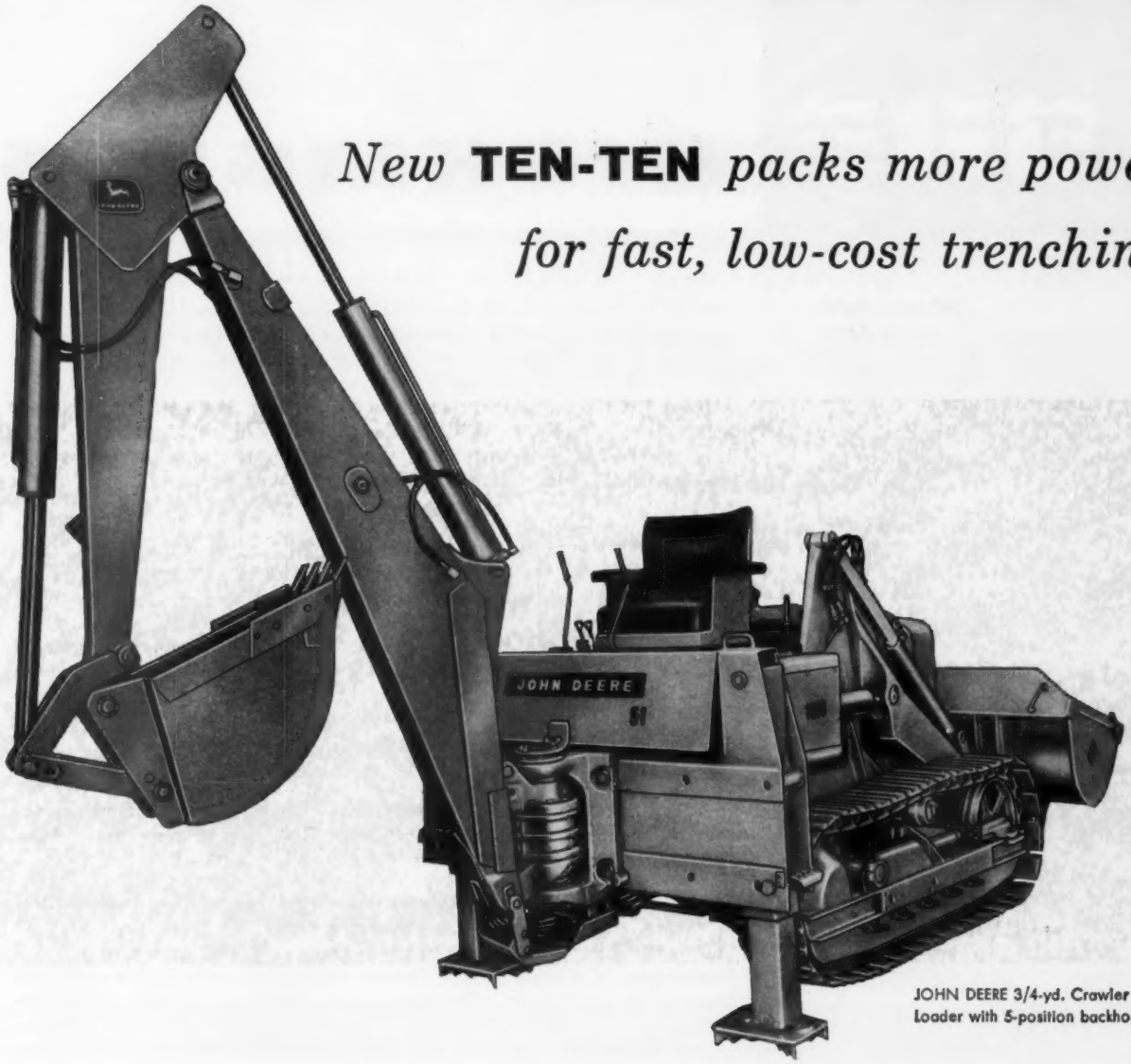
They wouldn't have to learn on the job.

The industry owes it to consumers and itself to make the effort of placing some of its best qualified people on FPC and other regulatory agencies.

J. Fred Ebsen

EDITOR

New **TEN-TEN** *packs more power for fast, low-cost trenching*



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GAS HIGHLIGHTS

Offshore fight looks dead

The U. S. Supreme Court apparently ended the years-long tidelands oil and gas fight. It denied pleas for a new hearing made by Mississippi, Louisiana, and Alabama. The Court did not explain its refusal. In a decision last year, Supreme Court ruled the mentioned states' boundaries were limited to three statute miles from the coastline. At the same time, it fixed the offshore limits for Texas and Florida at three leagues (10.5 miles). Involved: royalties from oil and gas production and who gets them—states or federal government.

Gulf's Searls suggests

David T. Searls, V/P & Gen. Counsel, Gulf Oil Corp., told INGAA that present drilling rates must be increased by 50 per cent to supply natural gas to meet the growth in demand to be experienced in the '60s. "But," he said, "producers cannot be expected to risk their money drilling such additional wells at the present field prices for natural gas." He suggested a committee representative of producers, transmission companies, distributors and consumers. Purpose: estimate the increase in demand of natural gas and to determine expenditures which must be made by producers within the next 10 years. He based future strength of the gas industry on the strength of domestic gas supply.

Alberta-to-California line rolling

Contracts for the dramatic 1400-mile natural gas pipeline from Alberta to California have been let. Pipe is being delivered, rights of way clearing has begun, and preparation of road, railway and river crossings for the 36-in. diam., nearly one-third billion dollar project.

Good and bad news from Washington

The news applies most directly to gas appliance and equipment manufacturers. The bad news, U. S. Supreme Court has been asked by FTC and Justice Dept. for the right to use confidential information from businessmen's reports to the Census Bureau in prosecuting antitrust cases. The good news, Eisenhower has signed a new law which restores a tax break to manufacturers and importers who give rebates to wholesalers and retailers for local advertising. It permits a manufacturer to deduct the cost of such co-op advertising from the selling price when computing the excise tax—up to 5 per cent of the cost.

Gas Association reorganizes

The Florida-Georgia Gas Association has been reorganized into The Florida Natural Gas Association. The new group has adopted a comprehensive gas industry promotional program. The association is composed of privately owned and municipal natural gas distribution systems in Florida. New officers are: President, John T. Bills (vice pres. of Peoples Gas System of Florida); Vice President, Dwight W. Sprow (exec. vice pres., The Houston Corp.); Secretary-Treas., Harry H. Phipps (The Houston Corp., sales).

Indiana gas expands

Expansion of natural gas service to central and southern Indiana communities has been kicked-off by Indiana Gas & Water Co., Inc. Franchises were granted by three communities near Indianapolis. Also, feasibility surveys in six other towns have been completed—with engineering surveys underway.

Connole evaluates Phillips

Addressing the American Gas Association, former FPC commissioner William Connole expressed his disbelief that the recent commission decision in "Phillips Case" will have any great effect on the trend of gas prices when considered on a short term basis. However, the long-range results will be "salutatory" for the industry because it codifies and establishes a firm pattern for the FPC's past actions. It makes action more logical and predictable.

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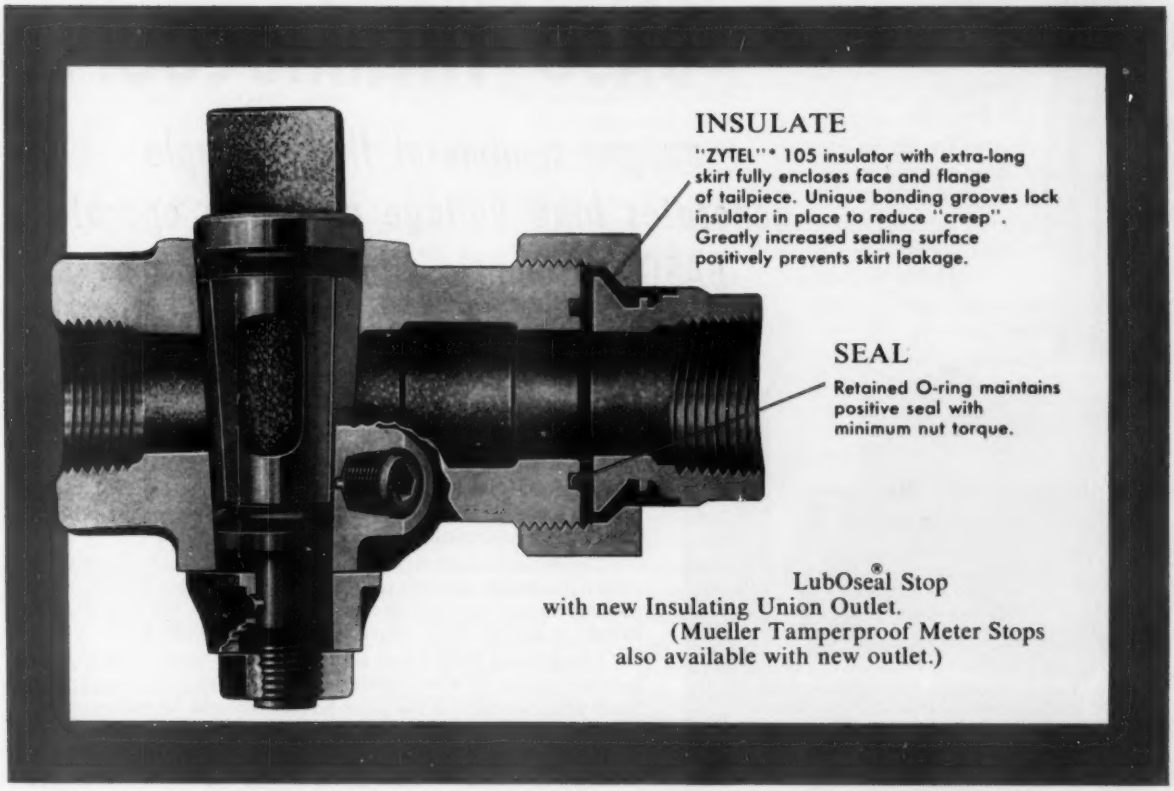
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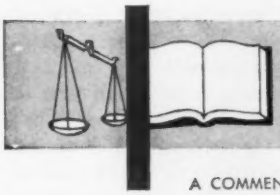

Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Canada likes U. S.

CANADA with its vast natural resources has favored the United States by releasing an additional one-half billion cu ft of gas daily. Canada likes U. S., and our friendly relations set a world example. For nearly 200 years as neighbors there has not been a fortification on the 3000-mile border between Canada and the United States. This new integrated international natural gas pipeline project, costing $400 million, will stimulate the West. This Canadian export will increase the gas supply to northern California 20 per cent.

The FPC decision by Commissioners Kuykendall, Stueck and Kline is a model of foresight, wisdom and diplomacy. A synopsis of that decision will give management in the gas industry a lift.

• Regulation by five agencies

The FPC examiner had tried to impose conditions related to future regulation of the return on Canadian pipeline investment and increases in Canadian producer prices. FPC wisely rejected those conditions in authorizing the United States part of the project.

The various components of the Canadian pipeline project are parts of an integrated commercial operation but are to be regulated by at least five separate agencies: the Alberta Board of Public Utility Commissioners, the National Energy Board of Canada, the Federal Power Commission, the Montana Public Service Commission, and the California Public Utilities Commission. Each of these agencies has plenary responsibility for the continuing regulation of its own segment of the project. Consequently any attempt by one agency to exercise controls within the jurisdiction of another would be ineffective. The determinations of each agency necessarily involve reliance on the regulatory activities of the others and some accommodation of their views of the best interest of the project.

The proposals of the Canadian companies for the initiation of the project on a flexible cost of service basis have been reviewed by the Canadian agencies and the necessary authorizations granted. FPC said that the imposition, at this point, of a fixed border price or fixed Canadian rates of return for the life of the project would require the Canadian authorities not only to reverse their determinations but also to abandon their jurisdiction to make further orders to reflect changing conditions in the Canadian industry. Complete renegotiation of all the Canadian contracts would follow. The inclusion of such conditions in the import licenses would be tantamount to a dismissal of the applications. Such radical alteration of the proposed project is unnecessary. The record made before FPC demonstrated that the Canadian proposals were consistent with the standards of the public convenience and necessity in the Natural Gas Act.

The chief concern expressed by the examiner was that future changes in the Canadian costs of service may not be adequately regulated by the Canadian authorities. The most important of these costs are the Canadian producer prices. Alberta & Southern entered into option agreements with several major producers covering areas containing both established and prospective reserves of great size. These contracts bind the producers to sell large additional volumes of gas at the same prices as those in the present contracts, when needed for future expansion of this project. These reserve acreage contracts should have a stabilizing effect on field prices in the future. Substantial volumes of the gas purchased by Alberta & Southern and by Westcoast and transported by Trunk Line will be delivered to local distributors in Alberta, thus creating a strong local interest in stable field prices.

Beyond these restrictions, there remains the primary responsibility of the Canadian authorities to regulate producer and pipeline rates in such a way as to insure that the mutual benefits of the project will continue. A careful review of the Canadian legislation, including the National Energy Board Act, the Alberta Pipe Line Act, and the Alberta Gas Utilities Act, and the determinations made on this project, demonstrates that the Canadian regulatory authorities have a comprehensive rate and certificate jurisdiction equal to FPC and broad enough, in letter and spirit, to give effect to the principles of international comity and mutual responsibility on which the continuing success of this project depends. This legislation embodies the same "just and reasonable" standards as are found in the Natural Gas Act and guarantees that the American and Canadian consumer will be treated alike.

• Canadian producer regulation

The Alberta Gas Utilities Act is broader than the Natural Gas Act and its clarity and scope with reference to gas producers and processors should enable the Alberta Board of Public Utility Commissioners to avoid many of the difficulties experienced by FPC. The field price section of this Act authorizes the board to fix the just and reasonable price for gas at any point from the wellhead through any type of processing plant to the

pipeline, and also for gas which has been shut in by order of the Conservation Board. Although the board may not set prices for liquid hydrocarbons extracted from the gas stream it may determine the proportion of the price received by a processor to be paid to the producer for the hydrocarbon content of the gas. It may determine the costs of processing to be deducted from the wellhead price by a producer who processes his gas before delivery. Under other sections of this Act, pipeline and distributor prices are to be fixed using a cost rate base and a fair return, but for determining producer prices the Act provides a broad discretion appropriate to the problem's exceptional complexities:

". . . in fixing and determining the just and reasonable price or prices . . . the Board is not required or compelled to fix or determine the price or prices for, in respect of, or on the basis of, any individual well or wells, or on the value or cost thereof, or the investment therein, or a rate of return thereon, but may instead fix and determine such price or prices as are applicable generally to all wells in a field, or may fix and determine different prices paid for gas produced from any classifications or groups, and in the fixing and determining of such price or prices the Board may adopt any just and reasonable basis or method of arriving at or computing such price or prices that the Board deems to be applicable or proper having regard to all circumstances and factors involved."

This provision of the Alberta Gas Act recognizes the conflicting factors in fixing a reasonable price for a primary commodity and furnishes the flexibility necessary under changing conditions to make a fair balance between the needs of the industry and of the consumer.

• Margin of profit

The interstate pipeline to be owned by Pacific Gas Transmission carried a pipeline cost of service that included a 6½ per cent return. The FPC staff recommended a ceiling of 6¼ per cent.

There was evidence that debt capital is available at 5½ per cent or less. Given PGT's 85 per cent debt ratio, a 6¼ per cent rate of return will provide PGT with a 10½ per cent return on common stock equity. This percentage may be reduced when 10 per cent of PGT's debentures are converted to common stock. However, in view of the recent improvement in the bond market, and PGT's being sheltered from many of the normal risks of business by its cost of service tariff and by the strength of the California market, FPC concluded that a 6¼ per cent rate of return is adequate.

• Allocation of costs

El Paso Natural Gas Co. already is serving markets in the Pacific Northwest with gas imported from Canada under a 1955 authorization. Pacific Northwest Pipeline Corp. obtained the FPC authorization, but recently merged with El Paso.

The gas from the new project for El Paso's Northwest division will be purchased in Alberta by Westcoast Transmission Co., and then transported through facilities of Alberta Trunk Line and Alberta Natural to the U. S. border for delivery to Pacific Gas Transmission. PGT then will transport the gas 105 miles to a connection with El Paso, which will build 17 miles of line to carry the gas to the Spokane area for delivery into its general system. El Paso will receive 136.5 mmcf on a daily average. To preserve the Northwest market's priority of service provided in the Pacific Northwest-El Paso pre-merger contract, the FPC order provides that any part of this gas not now required in the Northwest may be sold elsewhere on El Paso's system on a temporary basis. This condition applies until El Paso shows that this supply will not be needed for the Northwest. At least 30 mmcfd of El Paso's gas must be reserved for three years for probable new service in Idaho, Washington, and Oregon.

PGT's rate schedule allocated the total cost of service between PGT and El Paso for transportation service. A demand-mile formula was used related to El Paso's and PGT's peak day demands for gas.

There was evidence that there will be a large storage potential in the PGT pipeline which would enable Pacific Gas & Electric Co. to take a greater peak day volume at the California border than that received by PGT at the Canadian border. The tariff formula was amended to take account of that possibility by using the demand-miles of PG&E rather than PGT. If PG&E's demand should be the same as that of PGT, this change would not alter the result; but otherwise it will require PG&E to pay for any excess pipeline capacity it might use.

A further FPC objection to this formula was that it did not include a commodity factor to reflect variations in cost related to volumes transported. As long as all of the El Paso gas is delivered at the interconnection near Spokane at approximately the same load factor as PGT's service to PG&E, the use of a commodity factor might have little effect on the results of the formula. However, said FPC, when El Paso's new low load factor service is attached to the PGT line at various points in Idaho, Washington, and Oregon, the proposed formula may be discriminatory. The formula was further amended to apportion costs on the basis of demand-miles and commodity-miles in accordance with FPC precedent.

• International goodwill

This 1400-mile natural gas pipeline project is one of the biggest projects of its type. It will cross the Canadian Rockies, the Cascade mountains and 14 major rivers. The materialization of this pipeline project is destined to link Canada and the United States more closely together for at least the 25 years in the coordinated agreements. Goodwill is the inevitable product of this kind of foreign commerce based upon fair compensation for a supply of a commodity from one country and a need for it in another.

FPC asserted: "This proposal to connect the enormous Alberta gas reserves with the rapidly expanding West Coast markets is one which holds promise of great benefits to both countries. The distance from Alberta to the California border is only 722 pipeline miles; and the record demonstrates that the pressing needs of these American markets cannot be met from existing domestic supply." ■

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TECHNICAL TRENDS

By GUY CORFIELD
Professional Engineer,
Los Angeles

Travel trailers and mobile homes

The home on wheels is in many respects an amazing development. It is fast becoming an important factor in American housing — in fact, the number of such units is approaching 2 million and about 10 per cent of new housing now being built will be of this type. While there is no officially recognized or designated definition of demarcation, a travel trailer is in general one which can be pulled by a passenger automobile and is largely used for travel vacations. In many instances, however, it serves for all-year dwelling. The mobile home is a larger structure, is removed infrequently if at all, requires hauling equipment more powerful than the average passenger automobile, and its movement in some sizes and in some states is subject to permit and restricted hours and routes.

Travel trailers are used in a variety of lengths up to about 25 or 30 ft and in widths up to 8 ft. Mobile homes go up to 55 ft in length and 10 ft in width and are expandable up to 17 ft in width. Some of them are split-level and, in part, up to 12 or 13 ft in height. They may never be equipped with wheels, but rather built on skids and hauled to a trailer park for permanent location on pier foundations. They may be owned and rented by the park operator, or owned by the resident who leases space. They are connected to utility outlets furnished by the park operator, and in them are provided all the comforts of home including a complete set of modern appliances. Of the 2 million units built, it is estimated that 73 per cent are permanent or semi-permanent, 23 per cent are used for travel, and 4 per cent for field offices, mobile showrooms, etc.

This mushrooming and unconventional type of housing presents a new set of problems to control officials and the many agencies rendering service. The development is, of course, of great interest to the gas industry, representing a significant opportunity for service and appliance sales. It has also introduced some headaches. While in remote locations the gas supply may be L.P. gas, in most areas it is now natural gas. Each unit in a park, even though the stay may be only overnight, usually connects to gas and electric services. Should the gas company serve to a master meter only, and the park operator own sub-meters or charge a flat rate? Should the gas company have any responsibility for or give any assistance in leakage control of the yard lines? Should the gas company service the trailer appliances as they would render service to a regular permanent home?

Another complication has been the approval of trailer gas appliances. Heretofore AGA has not provided for approval of appliances designed for installation in moving vehicles or on ships. However, with trailers and mobile homes moving solidly into the housing picture, and ordinances in several states developing to the effect that trailer appliances must carry the seal of a nationally recognized testing agency (such as our AGA Laboratories, or the Underwriters Laboratories) the several AGA approval requirements subcommittees were instructed to prepare gas appliance requirements.

Some of the points to be considered, beyond or different to conventional requirements, were: At the time of manufacture and equipment, it must be assumed that each unit may be mobile at some time and to some extent and therefore be equipped to use LPG and also (except small travel trailers) to use natural gas; therefore means should be provided for conversion of the appliance from L.P. gas to natural gas, and vice versa, in a simple manner by the owner. Means should be provided for attachment of the appliance to the structure, and stability of appliance parts such as burners and flue pipe. Appliances must be able to operate with a total venting height, floor to roof, of 6½ ft as contrasted to the regular house height of 10 to 12 ft. Because of smaller living area and therefore more confined space than in a conventional house, precautions must be taken to ensure proper combustion and avoid liberation of combustion products into the living area. Also because of confined space, and resulting tendency to store things close to or against appliances, appliances should either be isolated by enclosure or have low surface temperatures.

Requirements have now been developed for free-standing ranges, built-in cooking units, water heaters, forced air furnaces, floor furnaces, recessed heaters, and are "in the mill" for clothes dryers, room heaters and refrigerators. In most instances (refrigerators being an exception), the difficult problems of ready conversion from LPG to natural gas and vice versa have been solved with what appears to be reasonable success. In general, exclusion of combustion products from the living space is by either isolated enclosure of the appliance or by use of the "sealed combustion chamber" principle. An exception, in heating requirement, is that vented recessed heaters of 25,000 Btu or less, while required to have adequate combustion air inlet opening from outdoors, can have combustion chamber communication with the interior air space to permit balanced pressure between the combustion chamber and draft hood.

Beyond these gas industry requirements which will in the normal course of events become American Standards, the American Standards Association has set up Committee A-119, Mobile Homes and Travel Trailers, under sponsorship of the Mobile Homes Manufacturers Association and the Trailer Coach Association "to develop minimum standards for the installation of plumbing, heat producing, and electrical systems and equipment in mobile homes and travel trailers, to protect health and assure safety." The action already taken by the gas industry in somewhat of a "crash" program is evidence that the industry and its Approval Requirements structure is ready and able to meet and adapt to rapidly changing or newly developing conditions.

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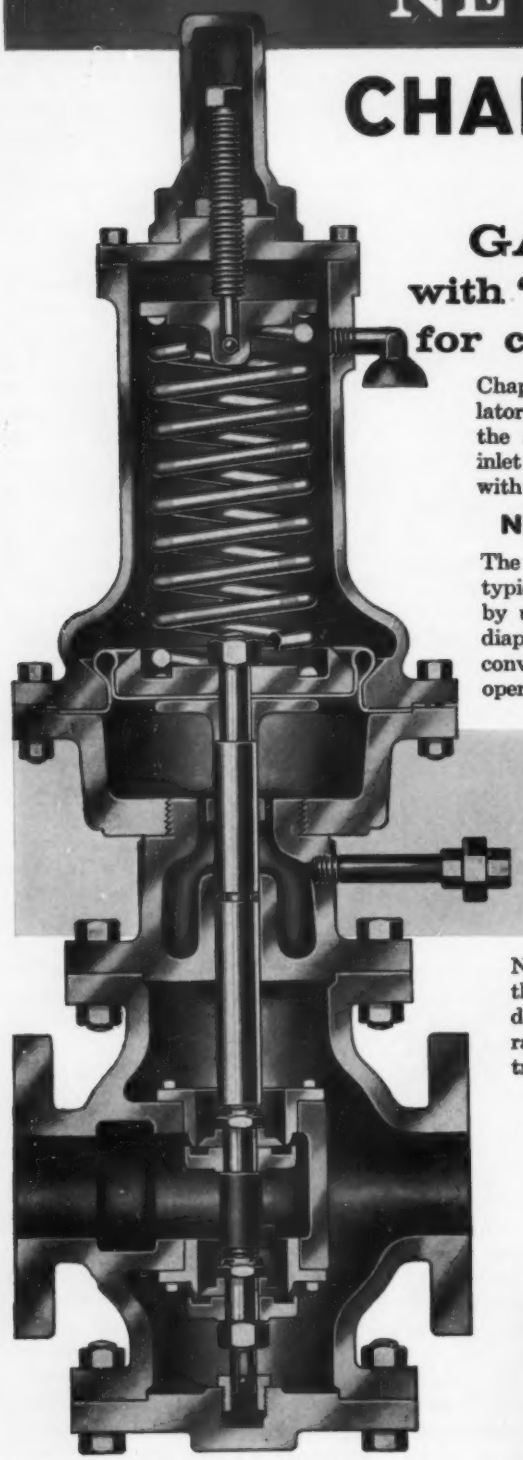

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WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau
1093 National Press Bldg.
Washington 4, D. C.

Partial legislative victory in sight

PARTIAL victory may be in sight for the embattled backers of natural gas legislation. But it'll come—if it does—by an end run rather than a power play.

Passage of a natural gas bill as such is still not in sight by a Congress certain to remain under liberal Democratic control. This is the outlook for measures in any way similar to the two which have been vetoed in recent years.

The chance of scoring lies in an entirely different field but presents strong possibilities of securing the same objectives — freedom from utility-type control for producers with the attendant incentives to increased production, stronger hold-the-price-line possibilities, and less diversion of gas to intrastate uses.

The opportunity lies in the near certainty that within a couple of years, the federal regulatory system will be revamped. When new rules, systems, procedures, and powers are charted for these agencies, of which the Federal Power Commission is one, an end to utility-type controls may be possible.

Support for reshaping these agencies is rapidly growing. The first steps will be taken next year, when passage of a simple "ex-parte" measure is a strong probability. This bill will set tight restrictions on contacts between industry or congress and the regulatory agencies. This is the most direct result of the scandal-hunting probes of the past three years.

The House Commerce Committee, headed by Rep. Oren Harris (D., Ark.), approved such a measure this year, and will probably quickly re-approve one again in 1961. (This is the committee which conducted the probes of the FPC and other agencies and turned up some scorching testimony.)

More important activities will begin on two other fronts about the first of next year. Over the long haul, these will produce the basic changes in the regulatory agencies. This is where the gas industry has its best chances of getting out of the present fog of federal regulation.

One study will begin about the first of the year by a new special "conference on administrative procedure," created recently by President Eisenhower. Judge Elijah B. Prettyman of the U. S. Court of Appeals in Washington will head the study. He conducted a similar project in 1953-54, and proposed that it be undertaken again because of the problems turned up in the past couple of years.

The heads of the six agencies involved also support the study. In a separate letter backing the study, the chairmen noted that "there is growing public concern over the cumbersome procedures, unnecessary expense, and the delays which have been steadily increasing in some of the procedures of the administrative agencies.

At about the time the Prettyman group opens its study, the Senate Commerce Committee under Sen. Warren Magnuson (D., Wash.) will also crank up a probe of the agencies. His is also aiming at methods of cutting "red tape, delay, and high costs" in the agencies. He says he'll work with the Prettyman committee.

Should Vice President Nixon win the election, and the Republicans hold onto the executive branch of government, it's a safe bet that there'll be more scandal-hunting by the Harris Committee. Because there'll be at least three vacancies on these agencies for the new administration to fill, some additional probing is likely in the Senate as well.

Thus, the stage is set in these various regulatory agency studies for the gas industry to make its bid for relief from oppressive government controls—although there is still no chance of complete decontrol of independent gas producers. There is a good chance of success if the industry unites, develops a sensible, realistic approach, and works skillfully to get such a plan through. Any incidents of the type which have killed the drive before will be disastrous now.

The gas bill drive is now taking on a completely changed complexion from those of previous years. In the past, various segments have drafted their bills, tried to reconcile them, and finally set out to attempt to win approval. Now, the drive is very likely to get mixed up with the complementing and conflicting legislative "want lists" of other industries.

Sources inside the coal industry associations have leaked their plans for what would be, from their standpoint, a shrewd double-alliance. They are trying to get various gas industry groups to pull back their opposition to the coal industry's national fuels policy drive in exchange for backing of a moderate natural gas bill.

At the same time, they're working with oil industry producers trying to develop a joint drive to clamp end-use controls on gas to strictly limit industrial sales at anything short of a pro-rated full-cost basis.

"This (end use controls to eventually block industrial sales) is

Continued on page 84

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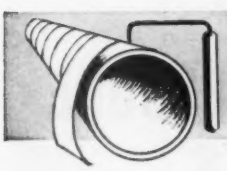

CORROSION PREVENTION

DISTRIBUTION TRANSMISSION

How do you know your line is protected?

By MARSHALL E. PARKER

Consulting Engineer
Houston

HOW can you be sure that your transmission line, which is under cathodic protection, is really protected throughout its length? A current survey was conducted, using approved and accepted methods, and a conservative system was then designed, again using accepted and quite conservative methods. This system was installed and checked out, and has since been operating without significant fluctuations. Can it not then safely be assumed that the system is under protection?

Unfortunately, the answer is no. It cannot even be said with perfect assurance that the above described system has ever been fully protected. The accepted criterion for this desirable state of affairs—complete protection—is the attainment on a potential of 0.85 volt negative, or more, measured with respect to a copper/saturated copper sulfate electrode adjacent to the metal surface, *at every point of that surface.* Two factors in this definition can give us trouble. In the first place, we seldom if ever place the electrode adjacent to the steel surface; yet if this is not done, there is an element of uncertainty in the degree of protection being had.

Actually, *when our lines have good coating,* this error is not large enough to be important, for the major part of the IR drop is that which occurs across the coating. It is for this reason that the use of a remote electrode does not always introduce a serious error. But if the coating is not good, either generally or locally, then this error can be significant, especially in high resistivity soil.

The other factor which is troublesome is the requirement that the specified potential be obtained at every point on the protected surface. Any survey, using techniques presently at our command, is necessarily limited to a finite number of points. How, then, can we be sure that the criterion is satisfied at *every* point? Normally, readings are taken at test leads which are usually installed at road crossings; the spacing may vary from a mile to as much as 10 miles, or even more, between adjacent leads. Again, when the line has good coating, this can be an adequate survey. The most likely areas of local failure are shorted casings. Such a feature, equivalent to a hundred feet or so of bare pipe, of diameter even larger than that of the line, represents an immense discontinuity in the current demand of the line. This creates a large potential "sink" in which the potential is depressed. Fortunately, recovery is usually rapid, and as little as a hundred feet from the end of the casing the line may be up to protective levels.

This can readily be determined by taking a reading with the electrode placed over the line at the point where the potential is desired, while the connection to the line is made back at the test lead; it is *not* necessary to contact the pipe at the point of the reading. As a matter of fact, a complete survey can be made over a line in this way if a lead is available which is long enough to reach half the distance between test leads.

It is puzzling at first to see how the potential of a line can recover to protective values on the side away from the rectifier, when a shorted casing has lowered the potential. The offhand interpretation of the attenuation theory does not allow for such a phenomenon; once the potential is depressed, it must slant down again from the depressed value. However, one of the assumptions made in the derivation of the attenuation equations, an assumption necessary in any mathematical treatment of a physical system, is the assumption that the current flow to the line is exactly transverse to the line. Another assumption is that the leakage conductance of the line is uniform. This latter assumption is clearly violated by a shorted casing, which represents a major discontinuity in the leakage conductance. This in turn brings about a violation of the first assumption, for there is a funnelling in of current from both directions for a considerable distance toward the scene of the large demand, the bare casing. It is for this reason that the discontinuity in potential can be a local lowering, with full recovery on the downstream side.

The same effect can be produced by any substantial bare area on the line. If there is a section of damaged coating, for example, there will be a slight depression of potential; if the area of damage is small, the depression may be so small as to be unimportant. But if the area is large enough, the potential may fall below protection. This is particularly true if the soil resistivity is high in the area; although this same factor, high soil resistivity, will mean that the loss of protection is less important. It is possible for potentials, in an area of good coating with general values as high as 2.0 volts, to drop

(*Continued on page* 87)

Revolutionary high pressure gas regulator...

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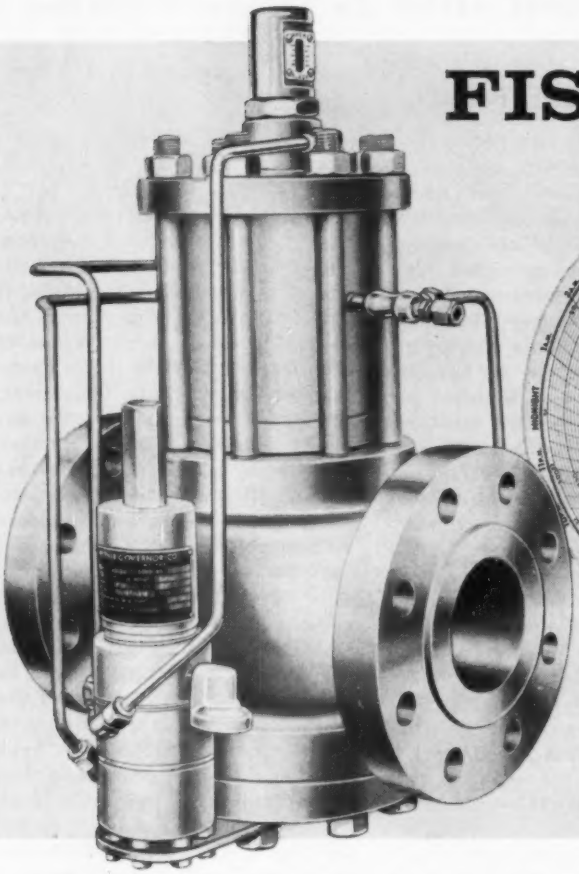

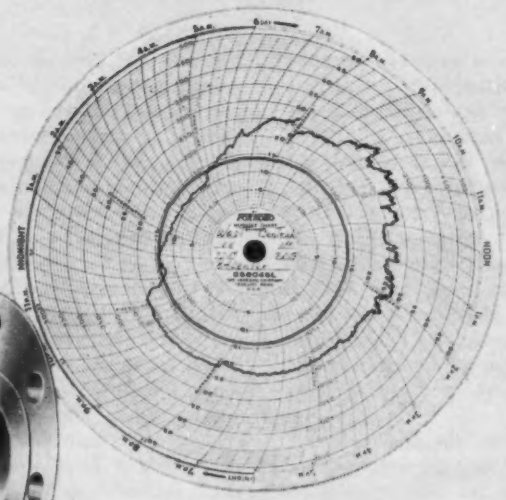

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THE GASSING GAME

By JIM CLARK • Gas & Oil Consultant, Houston

MANY gas producers held the opinion, shortly after the announcement of the FPC's decision of area pricing standards to replace cost-of-service regulations, that the action was constructive.

Some with whom I talked said that it was probably the best that producers could ever expect and that they were actually surprised at such a favorable and far-reaching policy declaration. Some said they had little hope of ever getting legislation that would relieve them of all regulation but that the FPC action did seem to take them out from under utility-type regulations.

In fact, most of those who have examined the matter seriously are of the opinion that the FPC's action accomplishes generally the intention of the first Harris bill. That was the bill vetoed by President Eisenhower following the revelation of an alleged attempt to influence a member of the senate by a contribution to his campaign fund.

Almost all independent producers believe they still need legislation and there is little indication that they will stop pleading for some kind of bill, especially one that would completely remove producers from any type of federal regulation.

But the general consensus is that the FPC action will relieve them of much expense and red tape necessary in fighting out their rate cases cost by cost and well by well. In the past they have considered the FPC's task an impossible one and one which placed the producer in an equally impossible position.

Few, if any, producers believe this is the last they will hear of this matter. They anticipate that both state public utility commissions and distributing companies will attack the FPC action. They admit that the FPC action in closing the Phillips case after more than six years of litigation will result in higher natural gas prices to transmission lines, distributors, and consumers.

But they also say that the danger of higher prices is not really serious. In fact, some of them believe it is possible that the new policy could result in a lowering and certainly a leveling off of prices. It was pointed out by one producer that already in some parts of the country that gas is actually losing markets to coal for the first time in many years and that this is the best indication of all that the price peak has been reached in natural gas prices.

While the Independent Petroleum Association of America counsel and spokesman, L. Dan Jones, was contending that the new policy merely substituted one form of confusion for another and that it meant very little to the producer, this attitude had not settled completely in the producing country a few days after the action.

There was still much room for argument on the new policy, but a feeling of relief from cost-of-service control was so great immediately that most producers felt almost as if their first proposed legislation had been put into effect by the commission. Most of them were inclined to cheer, and some did so in statements to the press, until the IPAA counsel spoke out.

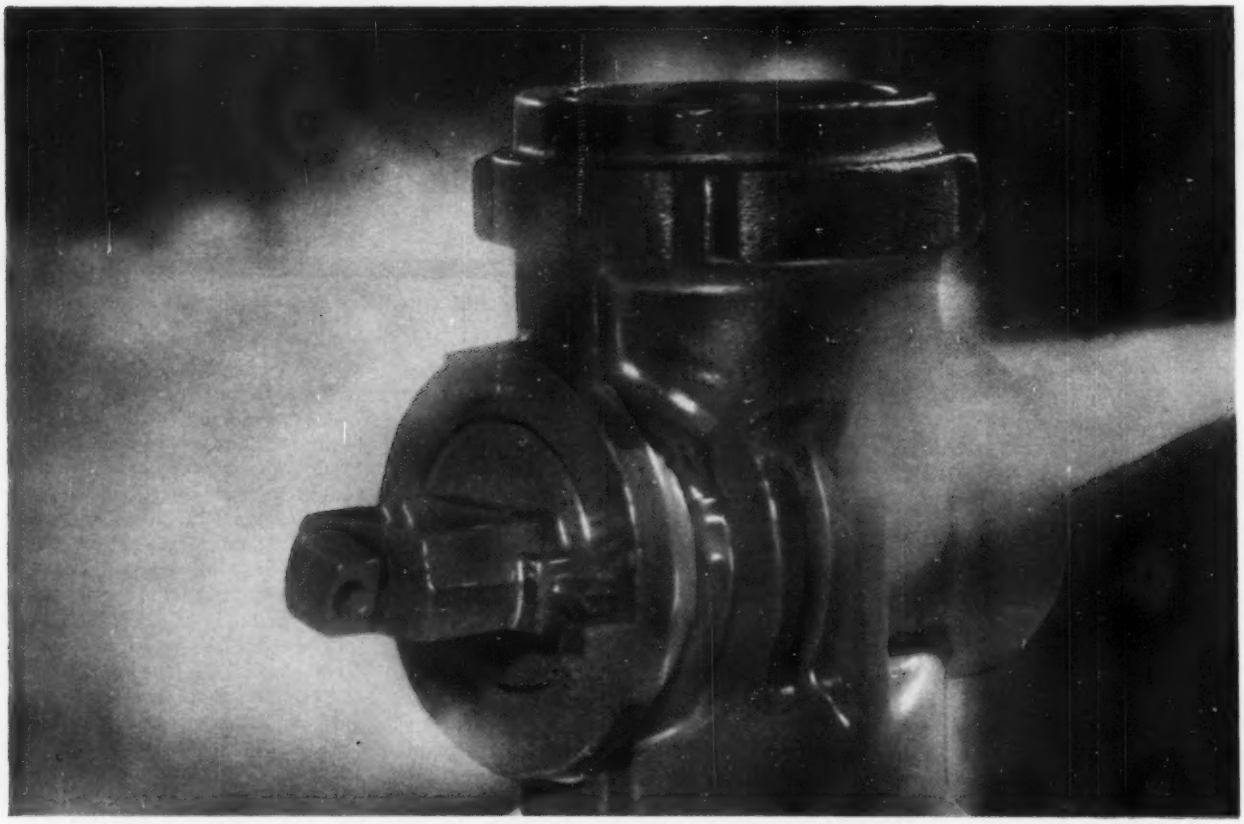
A day or so after his statement, however, a few producers said they considered the Jones position a logical one in view of the fact that the association contends that legislation is still necessary to relieve producers from any type of federal control.

All producers still hold this opinion. They do not believe there is any reason why they should be federally regulated. But they admit that the FPC has taken away one of their most potent arguments when they removed the utility-type regulations. For some time now much of their campaign in congress seems to have been directed toward the removal of utility-type regulations. Now it must be changed to one directed toward the removal of any and all types of regulations.

It is admitted that the FPC action may make the hope for legislation more remote. There is something of a dilemma possible in all of this, too, as an attorney for one of the producing companies pointed out. Someone is going to be forced to fight the public utility commission and distributor position that the new policy is wrong and that a return should be made to cost-of-service pricing. At the same time the same people, or their shadows, will be fighting for a new legislation on the ground that the new policy is no better than the old.

Right now producers generally think they are far better off than they were a month ago. They know they would be even better off with a good gas bill. But they foresee the legal fight to defend against attacks on the FPC policy decision and they also hope for new, clarifying legislation.

Some say the FPC action will weaken their case for new legislation. But others say it will strengthen their case, because it enables them to fight with more vigor. Many seem to think the industry has all it is going to get and they want to put everything into holding the new position. ■



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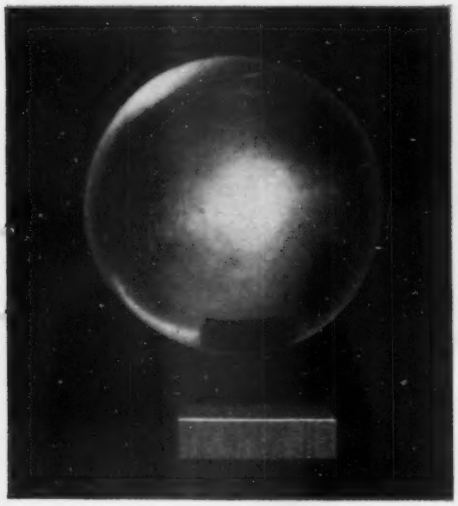
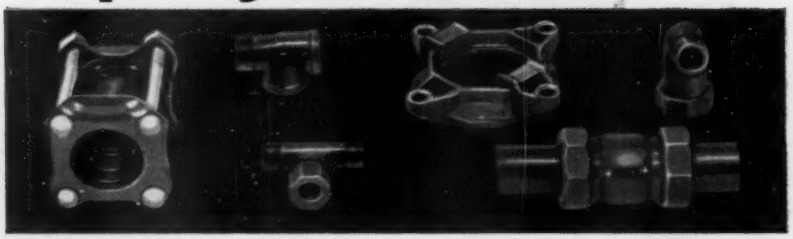
coating which cures in place without post baking in most cases. Over-spray is gathered in dust collector for re-use so there is no waste of material. "SCOTCHKOTE" Resin 101 eliminates shelf-life problems, mixing, weighing and solvent hazards.

with 100% Epoxy Powder



IMPACT TEST PROVES SUPERIORITY OF "SCOTCHKOTE" RESIN COATING 1.434-pound ball dropped from height of 8 feet shatters ordinary pipe coating. Eight-pound ball dropped from height of 6 feet six times on "SCOTCHKOTE" treated panel fails to disbond coating. Over 3,000 psi adhesion restricts damage to the point of severe impact. This is just one proof of the many superiorities of "SCOTCHKOTE" Resin.



PROTECT EVEN "DIFFICULT" SHAPED FITTINGS EASILY "SCOTCHKOTE" Resin can be sprayed on almost any shaped fitting or coupling. Odd-shaped valves, tees, and couplings, are the most difficult objects to protect. Now with "SCOTCHKOTE" Resin they can be brought to the job site with a "factory controlled" protective coating.

FOR MORE DETAILED INFORMATION on "SCOTCHKOTE" Protective Resin 101 write to 3M Co., Dept. EAL-110, St. Paul 6, Minn.

Electrical Products Division

"SCOTCHKOTE" IS A REGISTERED TRADEMARK OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK. CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

ALL-THE-WAY NEW

FORD Econoline TRUCKS

*Based on a comparison of latest available manufacturers' suggested retail delivered prices.

ALL-THE-WAY NEW TO SAVE IN 4 BIG WAYS!

New Van Turn an Econoline Van loose on your route and watch delivery costs plummet! Cargo space is up to 57 cubic feet bigger than conventional ½-ton panels! Big double doors at both rear and curb side give real load accessibility! Floor is level, too—no rear engine hump! And there's three feet less length to turn, park, or garage!

New Station Bus Nothing can match this beauty for comfort, room, and low costs! There's room to spare for eight. Converts to load hauling in just a few minutes. And what a load—twice that of the "biggest" station wagons! Best yet, it gives you up to 30 miles on a gallon, and it's priced below even compact station wagons!*

New Pickup Meet a revolutionary new pickup that saves more ways than any truck you've known! Modern cab-forward design pares away over a thousand pounds of dead weight, yet you get as much payload capacity as many standard ½-tonners! It's three feet shorter over-all, yet there's a big 7-ft. box with 73 cubic feet of loadspace! You get lively performance in a proven Falcon Six that can give up to 40% better gas mileage . . . saves up to $215 a year! And, the best news, it's priced below many standard ½-tonners!* See it at your Ford Dealer's!

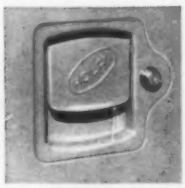
1. **Low price!** Save from the start with Ford's traditionally low prices!
2. **Up to 30 mpg!** In certified tests, the Econoline Pickup delivered 30 mpg . . . you can save as much as 40% on gas!
3. **Less dead weight!** 1050 pounds less chassis weight, yet carries over ¾-ton payloads!
4. **Bigger loadspace!** 7-ft. box—up to 23% more room, but 3 feet less truck length to handle!

FORD TRUCKS COST LESS

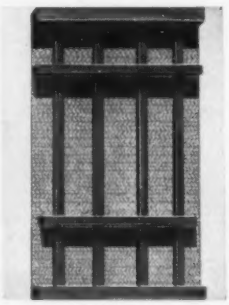
YOUR DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE!

FORD DIVISION, Ford Motor Company,

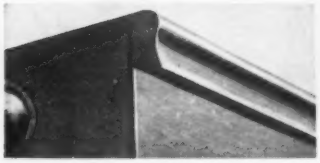
Holan service bodies last for years and years



indented door handles



extra channels for extra body strength



stiff, water-shedding rub rail

one-piece, automotive-type fender and panel

There *is* a difference in gas bodies—and this one has the difference.

All Holan Gas Meter Service Bodies are made of long-lasting, corrosion-resisting high-tensile steel. And they have countless features that give you extra years of service. For instance, the compartment doors have double panels, concealed nylon hinges, door checks and indented handles.

Vertical and horizontal compartments carry copper tubing, conduit and all your miscellaneous parts and equipment. In addition, there is extra room for gas meters in the bed of the truck as well as in compartments.

Look over the features at the left—and ask your Holan Field Representative to show you more.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

...and time is money. Man/minutes never cost more than they do now. Dependable, easy-to-install Dresser couplings and fittings are faster than any other pipe-joining method. They can save you minutes that add up to important dollars. Whether you want speed for economy, or speed for convenience (and economy)—specify Dresser with confidence.

dmd

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MANUFACTURING DIVISION
BRADFORD, PENNSYLVANIA

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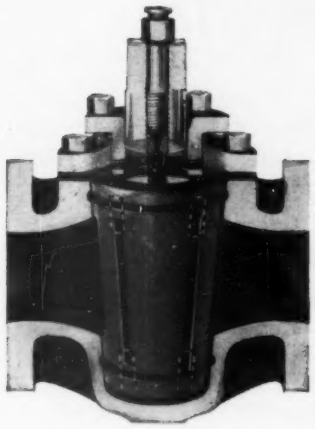
ELECTRONIC
INDUSTRIAL

the idea:

Force Can Be Multiplied Through Hydraulics

Blaise Pascal in 1625 demonstrated that a given force can be multiplied almost infinitely through use of hydraulics. His principle: "a unit pressure applied to the liquid contained in a sealed vessel is transmitted to every part of the liquid with undiminished force, thus multiplying the force many times . . ."

the application:



How It Helps Give You A Better Valve

In the Rockwell-Nordstrom valve (the *original* lubricated plug type), lubricant is injected under pressure creating powerful instantly replaceable seals against leakage in the Sealdport® grooves between plug and body. Lubricant also hydraulically jacks and balances the plug to maintain perfect seating, instant operation.

the benefits:

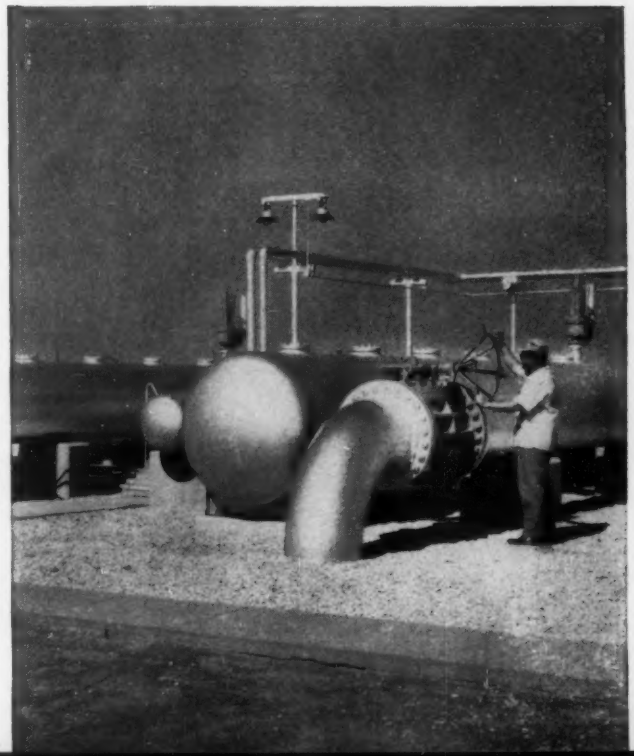
Positive Shut-Off . . . Instant 1/4-Turn Operation . . . Unexposed Seating, Longer Life, Lower Cost

For a full range of services, Rockwell-Nordstrom lubricated plug valves insure the trouble-free operation and freedom from wear and repair that you can only expect from a *lubricated* mechanism. See your supplier or write for complete details on Rockwell-Nordstrom lubricated plug valves, lubricants and operating accessories. Or better yet, have a Rockwell field engineer visit you. Rockwell Manufacturing Company, Dept. 101L, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International S.A., Geneva, Switzerland.

Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES
another fine product by
ROCKWELL

Rockwell-Nordstrom pipeline valves close 2 to 5 times faster than non-lubricated valves. Powerful positive seals of pressurized lubricant assure leak proof operation.



What does **Performability** *mean to your fleet operation?*

Your own fleet operation will show real savings and run far smoother with the '61 Lark. Already fleet proven in wide use, The Lark with new improvements and advances has Performability – and here's how you benefit:

Even greater Economy! The all-new Skybolt Six engine, of valve-in-head design and 112 HP, has already shown 17% greater gasoline mileage than Larks used in more than 1000 fleets last year . . . pre-tested and proven in the field by the largest "blue chip" fleet operators!

Even greater Performance! Acceleration your drivers want—10% better at low speeds, 18% better at middle speeds, 35% better at high cruising speeds for safe passing.

Even greater Driver Comfort and Safety! A new recirculating ball steering system and new front suspension make steering 30% easier. Also new for '61—handsome safety-padded dash—increased legroom—smart low-silhouette body styling—increased visibility—oversize bonded brakes! And still those wonderful flat floors, high headroom, big seats, matchless roadability.

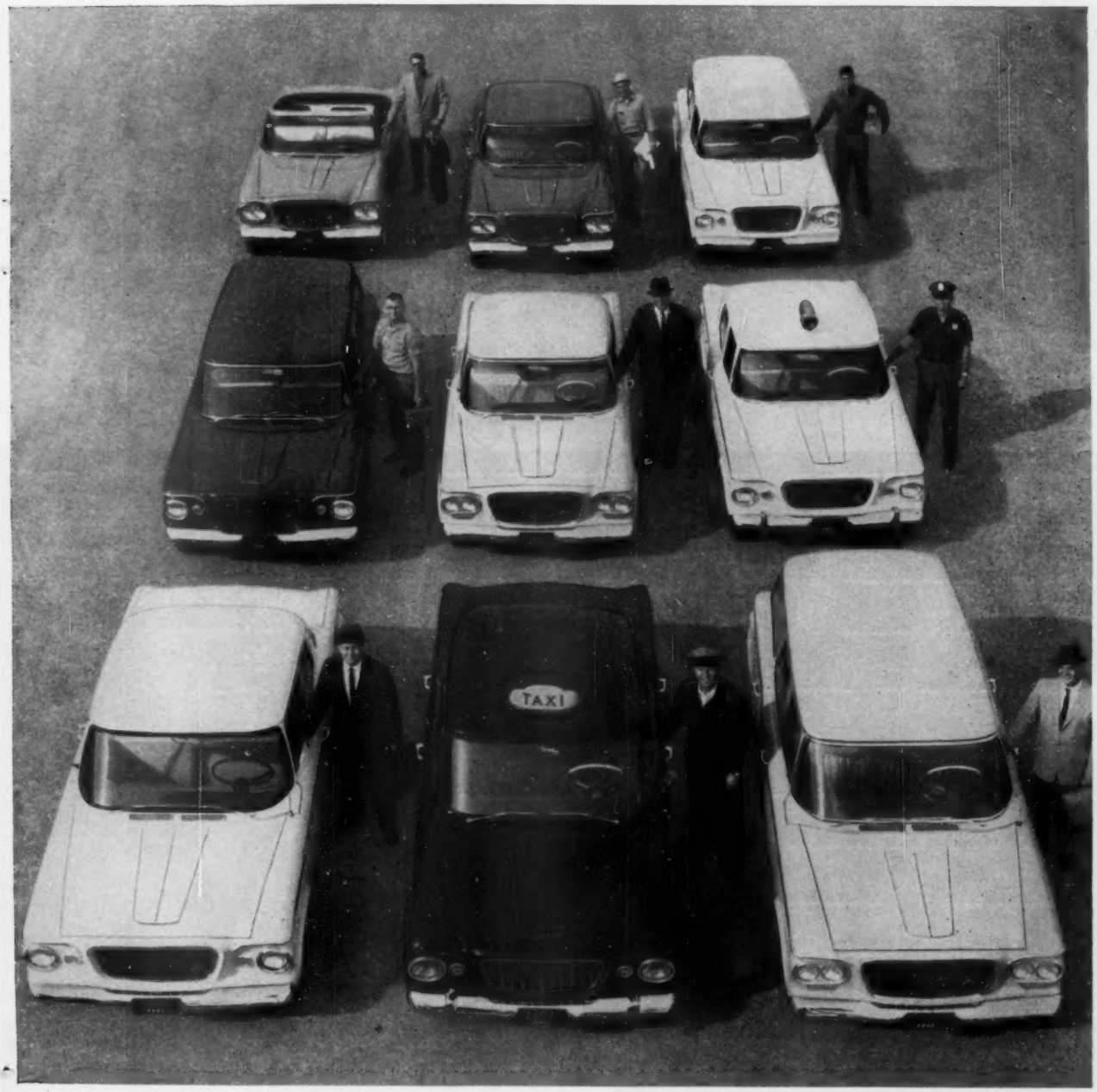
Even greater Maintenance Savings! Fleet records already show The Lark saves ⅓ on maintenance, compared to other cars. But this year new brakes, new larger clutch (for the Skybolt Six) and several servicing improvements (such as a counterbalanced hood) will save you even more.

The Sum Total of 2000 engineering and design improvements, perfected and coordinated, give the '61 Lark unique response, economy, durability. That's '61 Lark PERFORMABILITY. You have to drive it to believe it!

NO CLAIMS, NO GUESSES—THESE ARE THE FACTS

Actual field tests by commercial and government fleets show uniform satisfaction—"Excellent acceleration from standing start, good passing performance"..."Good hill climbing"..."Excellent maneuverability and directional stability"..."Exceptionally good (steering) response and light touch"..."Good clutch and brake action"..."Better roadability than any car I have ever used."
Certified by United States Testing Company.

113" WHEELBASE LARK | CHAMP TRUCK | 108½" WHEELBASE LARK



YOUR WIDEST CHOICE – A SUPERIOR-PERFORMING FLEET VEHICLE FOR EVERY FLEET NEED!

The new

'61 LARK

by Studebaker

Performability

you have to drive it to believe it!

LET US SEND YOU THE FACTS!

Fleet Sales Division, Studebaker-Packard Corp., South Bend 27, Indiana

☐ Send us informative literature only

☐ Have a factory representative call me for an appointment

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COMPANY _____

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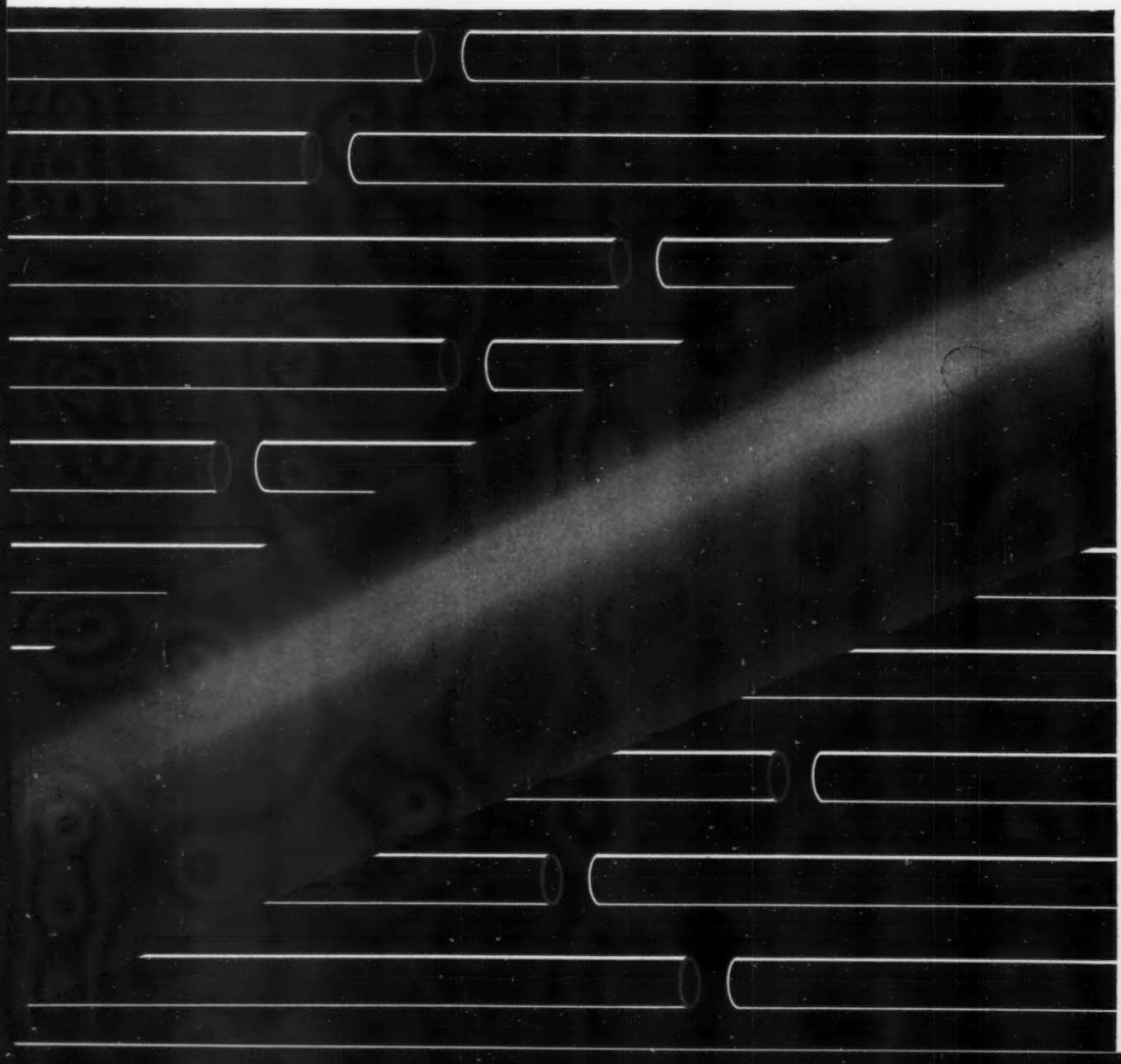
REPUBLIC IS READY...
READY WITH



LIGHT WALL!

With this newest kind of electric weld line pipe

YOU SAVE UP TO 1/3 THE COST!

Republic has it—light wall electric weld that is ideal for low pressure gathering and distribution applications. Manufactured to applicable parts of API Specification 5L, Republic Light Wall saves you up to ⅓ the weight, ⅓ the cost.

Light wall pipe is joined by welding or with light wall pipe fittings. Or, pipe may be grooved for Victaulic Couplings. Republic X-TRU-COAT is supplied in all sizes of light wall pipe. Provides an ideal combination of the strength of steel and the protection of plastic.

YOUR REPUBLIC SALESMAN has complete details. Get in touch with him today or mail the coupon.

REPUBLIC STEEL

Electric Weld • Fusion Weld • Continuous Butt Weld
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1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on Light Wall Line Pipe.

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Company_____

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City_____ Zone____ State_____

MISSILES TO MUFFLERS

Bridge production gap for oil field manufacturer

Beaird-AMF A company on the go!

NEW PRODUCTS, SKILLS, IDEAS SPARK DRIVE

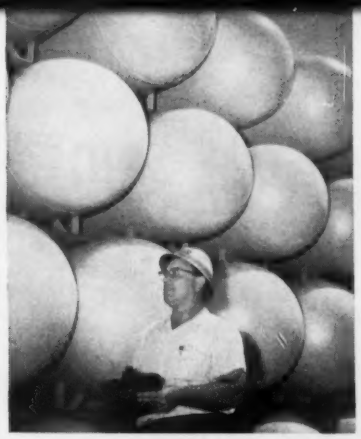
Under the guidance of a tall (6′3″) soft-spoken Texan, President John L. Tullis, Beaird is on the rebound from a low caused when the oil industry skidded into its own personal recession in 1958.

Long a major supplier of equipment (skid-mounted packaged compressors, pressure storage vessels, rail tank car tanks, steel piling, LP-Gas transports and home LP-Gas systems), Beaird has repeatedly demonstrated its ability to move swiftly in a competitive situation. Pioneering with the first packaged compressor plant in 1946, they established and dominated the market for this product despite intensive competition. Equally in the LP-Gas industry, Beaird moved, in five years, from its first LP-Gas system in 1946 to the industry leadership, with a host of products serving every phase of the market from dealer to home.

Now entering new markets with new creatively engineered products ("Belex," a self-operated condensate recovery unit for installation at wellheads and a skid-mounted complete gasoline plant composed of eight separate processing units), Beaird has received an additional boost from acquisitions and defense contracts. Maxim, the oldest name in silencers (gross sales $3,000,000 in 1959) has been acquired by AMF and assigned to Beaird to manufacture and market. The bustling shop program is also producing an $8,500,000 order for giant Atlas Missile launching components and a large order for stainless steel Titan missile fuel tanks. Beaird has targeted a stepped-up sales goal in '60 and is headed upward with a rush that may well take it far beyond its most optimistic predictions. From its people in the shops to its wide-flung dealer and sales organization, there is a firm belief that Beaird-AMF is a company on the go . . . *and getting there in a hurry!*

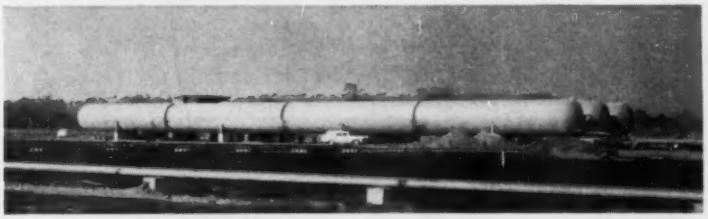
BEAIRD - AMF

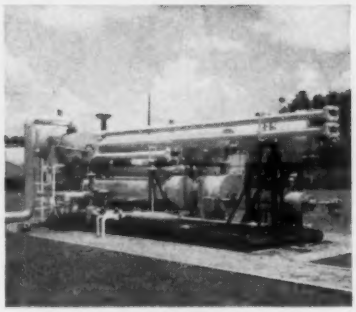
World's Largest Fabricator of LP-Gas Systems



Long lasting enamel finish is just one of many basic improvements Beaird has brought to LP-Gas industry. To make new finish possible Beaird installed giant "assembly line" plate shot blast equipment at both Shreveport and Clinton plants. Beaird has continued to strengthen its LP-Gas market position with a vigorous dealer program that includes area stocking and long term financing.

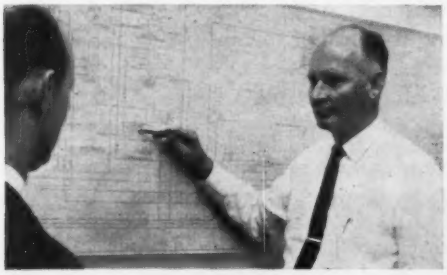
CO_2 Transport, has welded aluminum shell over four inches of insulation that surrounds the T-1 steel . . . 325 psi tank. Other specialized Beaird units are formed of stainless steel for chemical hauling. T-1 Steel Transports for LP-Gas Market lead Beaird transport sales.



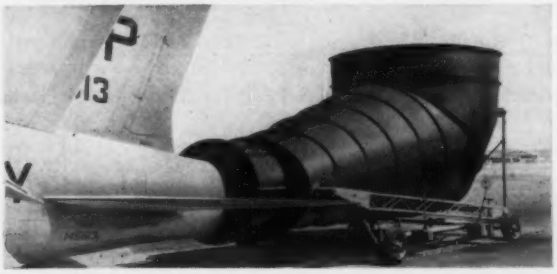


World's largest LP-Gas storage vessels — capacity 5,000 bbls. each were built by Beaird for Creole Petroleum, Venezuela. One of firm's oldest and best known products, Beaird storage vessels are manufactured in a size range from 6,000 wg. to 105,000 wg. capacity for the oil, gas and petrochemical industries.

Belex Condensate Recovery unit, mounts at wellhead to extract hydrocarbons (gasoline, propanes, methanes, etc.). Fully packaged and automatic in operation, the Belex unit offers high product recovery with low installation cost.



10,000,000 Cubic Feet of Gas per Day can be handled by this Beaird Skid Mounted Gasoline Plant. Expensive field labor and installation hook-up is reduced to minimum and the plant is almost wholly salvable when moved to a new location. It was process engineered and installed by O. L. Olson Engineering, Houston, Texas.



Twenty-five ton silencer, one of the many Maxim silencers now produced by Beaird. Others include little two-pound units for home lawn mowers, sizes for heavy duty engines and special types for ships and industrial plants.

another AMF BEAIRD product

THE J. B. BEAIRD COMPANY, INC.

A subsidiary of American Machine & Foundry Company

SHREVEPORT, LOUISIANA

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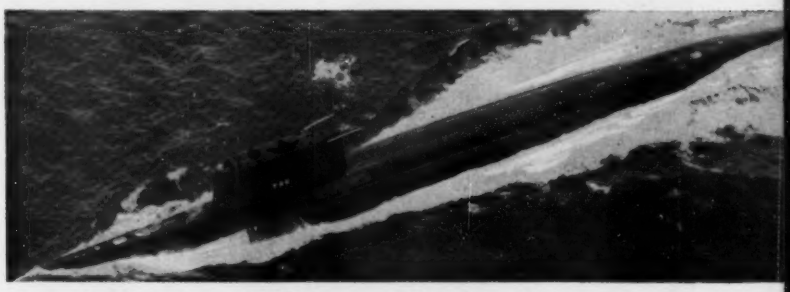
BEAIRD INTERNATIONAL, INC.
SHREVEPORT, LOUISIANA



Navy Submarine has an AMF-Maxim monel and stainless steel sea water plant which demonstrates Beaird's new metal handling skills. Fabrication including welding of aluminum and magnesium for rail tank cars as well as work in other exotic metals has become a routine assignment at Beaird.

HERE! CHEVY'S CORVAIR 95 CORVAN

■ Workshop and warehouse under one roof! Here's a truck with all the earmarks of an ideal installation, repair or cable splicing vehicle. The new Corvan is only 68½" high on a trim 95" wheelbase, but inside you'll find all the space you need. The load compartment area is 109" long, 60" wide and 54" high at the center; designed to handle 1,800 pounds worth of equipment, tools and materials. That's more load space than you'll find in a conventional half-ton panel.

■ Easy to handle, easy to load! Fifty-fifty weight distribution front and rear, loaded or unloaded, and 4-wheel independent suspension account for the Corvan's remarkable light-handed steering and stability. The cab's roomy; visibility is exceptionally good with no hood between the driver and the road. And you find this one practically loads and unloads itself. Those side doors open a full 49" wide, with loading height a low 14". Rear end loading height is only a shade over two feet.

■ Low-cost performance of an air-cooled rear engine! Tucked neatly under the rear load compartment is a "pancake" type 6-cylinder engine made almost entirely of aluminum. Its efficient horsepower to pound ratio contributes significantly to its operating economy. And because the engine is air cooled, you never have to buy antifreeze. No water is ever used. You can count on quick warmup, a special advantage in daily stop-and-go service. A 3-speed Synchro-Mesh transmission is standard with a 4-speed gear box or Powerglide automatic transmission optional at extra cost.

■ Parts and service as near as your Chevrolet dealer's. That's sure to be near, too, with well over 7,000 dealers in the land and Chevrolet parts warehouses located across the country from coast to coast. You can count on keeping your Corvan units always fit and on the job—an especially important consideration in your line of work.

There are two Corvair 95 pickups also; one has an ingenious swing-down side loading ramp. Maybe that's your truck. At any rate your Chevy dealer can tell you about all of them. He's the man to take it from here.... Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET

More load space, less road space, from a truck that practically pays for itself in savings!

THE *NEW* ROOTS 3000 cfh* GAS METER IS "JUST A BULGE IN THE LINE!"

*Size 3M125 ½ actual size

Gas men who've previewed it are mighty excited about the cost saving features of the new Roots-Connersville 3000 cfh rotary gas meter. Only 14" long, a workman can pick it up with one hand and carry it under his arm.

Because it incorporates the famous Roots rotary positive displacement principle, accuracy is permanently locked in for the long, trouble-free life of the unit. Actuated by the gas flow itself, twin rotors displace a fixed volume of gas with each revolution, unaffected by variations in pressure or flow. Extremely close clearances between rotors assure accuracy while eliminating all friction and need for internal lubrication. Occasional replenishing of oil is the only maintenance required under normal operating conditions.

Here, is *the* efficient and economical way to meter industrial, commercial and institutional gas loads. Call in your Roots-Connersville sales engineer or write for complete data.

- Replaces meters several times its size and weight
- Only 14" long—mounts in the line
- A bare 53 pounds
- Accurate to 3000 cfh and up to 125 psi
- Easily installed
- Direct reading or can be instrumented
- Quickly tested on standard equipment
- Virtually eliminates maintenance
- Requires no special supports

ROOTS-CONNERSVILLE BLOWER DIVISION
900 W. Mount St., Connersville, Indiana
In Canada—Roots-Connersville Blower (Canada), Ltd. • 629 Adelaide St., W., Toronto

ROOTS
first in air and gas handling equipment

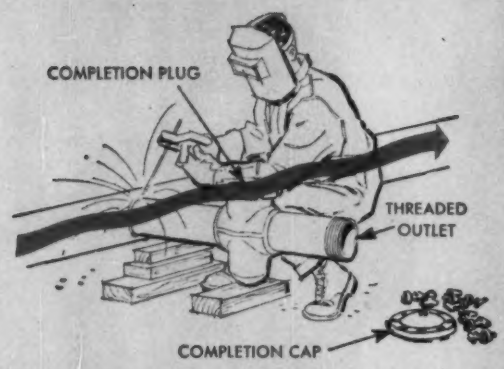
DRESSER INDUSTRIES, INC.
OIL • GAS • CHEMICAL • ELECTRONIC • INDUSTRIAL

hot taps without

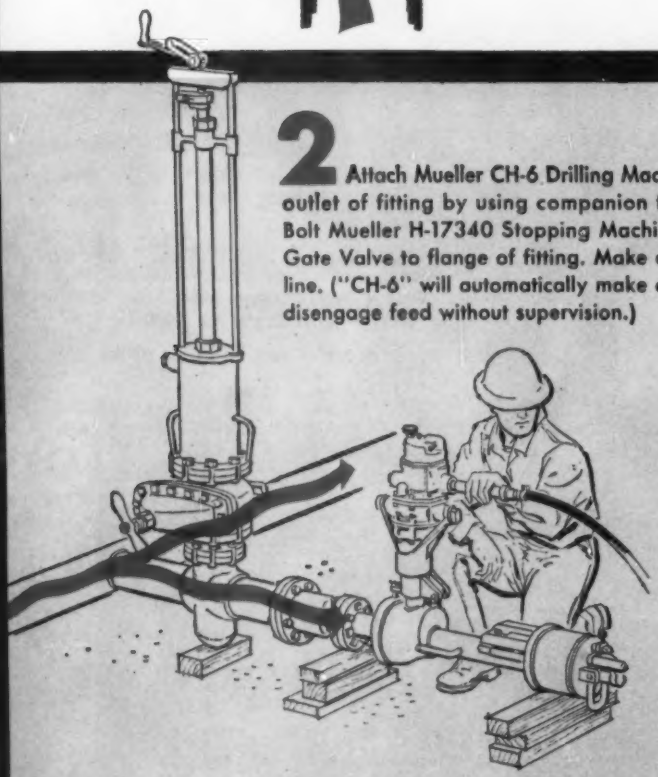
PROBLEM:

Tie in a new, permanent 6" line to present operating system without interrupting flow. Provide means of valving in new line without installing permanent valves.

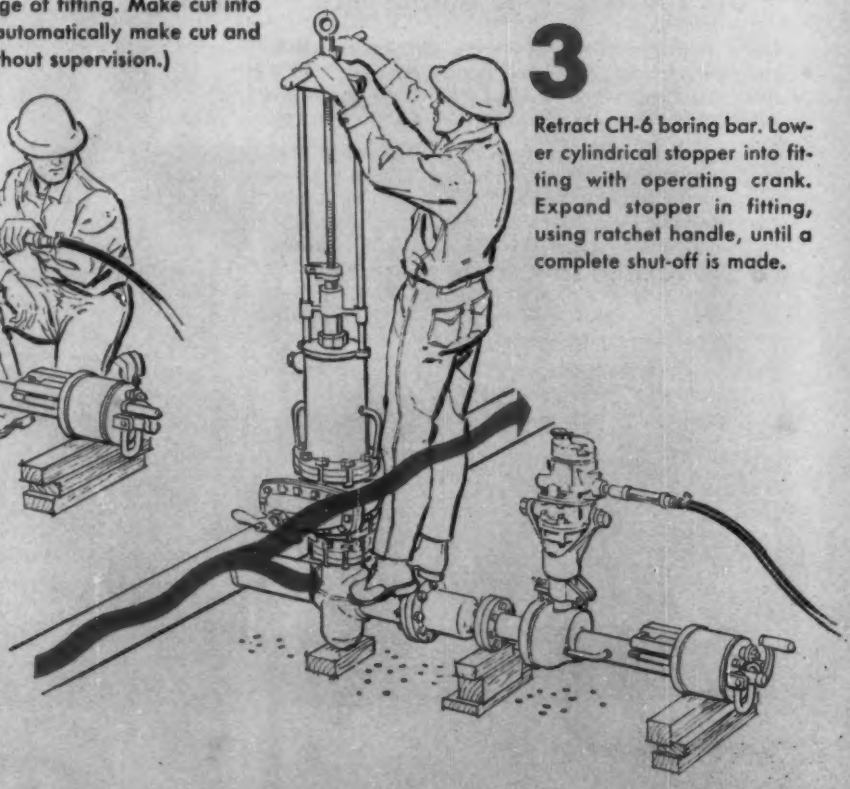
HERE'S HOW



1 Weld exclusive Mueller Extension Stopper Fitting to operating line. (6" fitting shown. Other sizes from ¾" to 8" available.)



2 Attach Mueller CH-6 Drilling Machine to outlet of fitting by using companion flange. Bolt Mueller H-17340 Stopping Machine and Gate Valve to flange of fitting. Make cut into line. ("CH-6" will automatically make cut and disengage feed without supervision.)



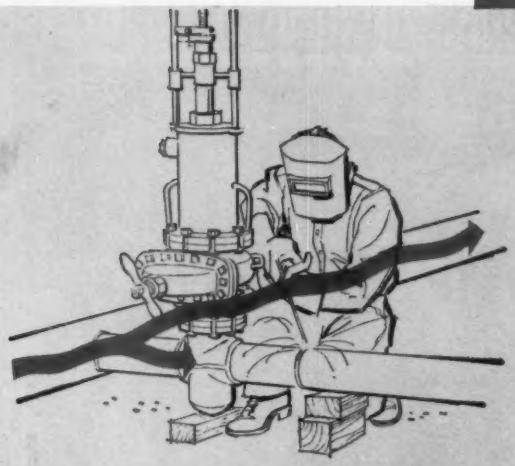
3 Retract CH-6 boring bar. Lower cylindrical stopper into fitting with operating crank. Expand stopper in fitting, using ratchet handle, until a complete shut-off is made.

valves!

ANOTHER IN A SERIES

on applications of

MUELLER® NO-BLO® METHOD

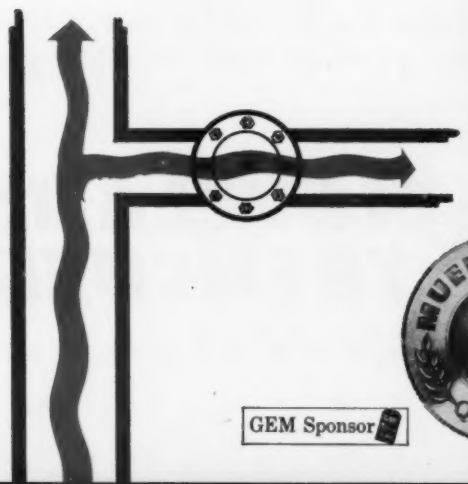


4 Remove CH-6 Machine. Attach new line to fitting and extend to next valve. (Companion flange may be used to connect line or threads may be cut off for welding connection.)

5 Equalize pressure in new line. Contract and raise stopper. Close valve and remove stopping machine. (New piping is now under full pressure.) Bolt Mueller H-17346 Completion Machine to gate valve, open valve and screw completion plug into top of fitting. Remove machine and gate valve and bolt completion cap to flange of fitting.

SOLUTION:

Line has been safely tied in under full system pressure without shutdown or other disturbance to operating facility. Only maintenance-free fitting remains in new line—no valve! Stopping machine may be re-mounted on fitting and line stopped-off whenever needed.



GEM Sponsor

These fittings and machines are just a small part of Mueller's complete system of No-Blo products—products especially designed for use with fluid facilities under pressure.

No-Blo products and methods make it possible to extend dead ends, to transfer service to another line, to isolate a section of line, to repair leaks, to make tie-ins, to run laterals, to install or replace equipment—all under full operating pressure in a safe, controllable manner and without shutdown!

The No-Blo System is typical of the constant attention to detail—and more than a century of experience—in research, design and engineering that is a part of all Mueller fittings and equipment.

Mueller also manufactures a full line of components for water distribution systems, fire protection systems and plumbing systems.

Write for complete information and specifications.

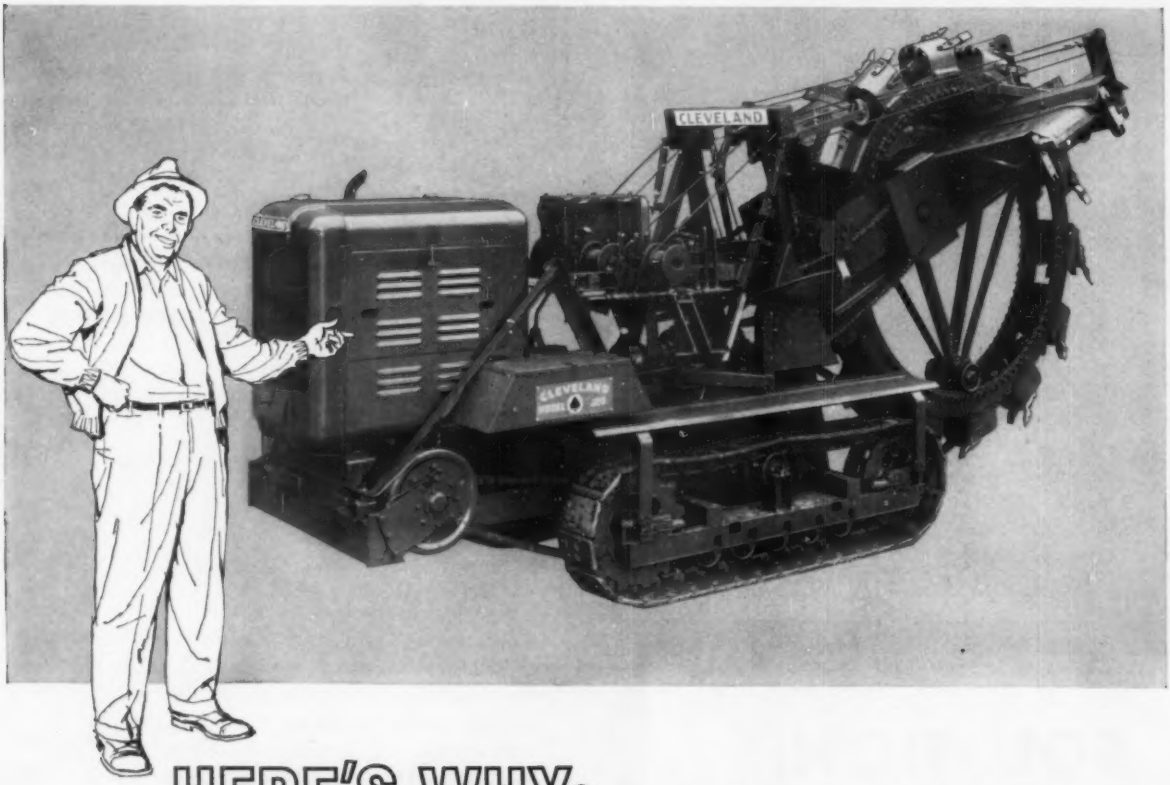
MUELLER CO. Since 1857 SERVING the Water and Gas Industries QUALITY

MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited, Sarnia, Ontario

THERE'S NOTHING LIKE THE CLEVELAND J-20 FOR DISTRIBUTION TRENCHING



HERE'S WHY: At his seat, the J-20 operator shifts the conveyor from side to side, controls the conveyor belt speed and direction, steers, hoists—in fact, has 100% control of every machine function. With the J-20 he maneuvers efficiently, sneaking by poles, trees, etc....cuts trench as close as 18 inches from side obstructions...places spoil where desired...digs to precise grade and width in all soils...gets high daily production on services as well as mains.

The Cleveland J-20 digs more trench...in more places... at less cost. Get the complete story from your distributor.

CLEVELAND TRENCHER

THE CLEVELAND TRENCHER CO., 20100 ST. CLAIR AVE., CLEVELAND 17, OHIO

UNEQUALLED IN ITS CLASS

RELIANCE SERIES 1200

DOMESTIC SERVICE REGULATOR

Developed specifically for house service installations, the economical Series 1200 four-inch diaphragm class regulators provide many *exclusive* quality features with field-proven, dependable performance. Series 1200 Reliance regulators provide the most advanced design for those companies whose systems lend themselves to use of small regulators for compact meter settings.

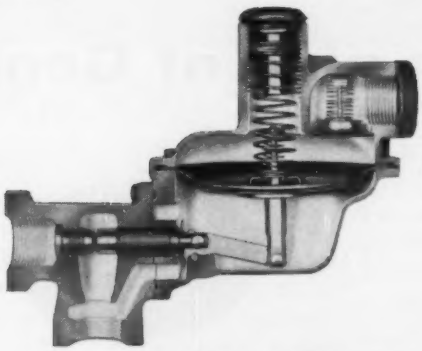
Capacity of the 1200 Series is 270 cfh at 2 psi inlet, $\frac{5}{16}$-inch orifice and 1-inch w.c. pressure drop, with correspondingly higher capacities for other inlet pressures and orifices. Suitable for inlet pressures to 125 psi and outlet pressures from 5- to 15-inches w.c. Manufactured to conform to A.S.A. Code requirements.

Two models are available . . . standard Model 1203 and *full capacity internal relief* Model 1213B. Both models are also provided as Series 1300 regulators with *detachable* meter bar for 6- or 11¼-inch connection centers.

See Bulletin 105 for complete details and specifications.

CHECK THESE EXCLUSIVE FEATURES!

- RUGGED CAST IRON PIPE SECTION provides maximum strength — prevents thread galling.
- POSITIVE LOCKUP — gives over 20% greater available lockup power than any comparable regulator of its class — provides greater safety factor in event of foreign matter on valve seat.
- REMOVABLE DIAPHRAGM SECTION for ease of servicing without disturbing piping connections — valve seat disc easily replaced.
- TWO-PIECE CONSTRUCTION permits choice of four valve head positions.
- ADJUSTABLE RELIEF VALVE for accurate setting of any desired relief pressure.
- DETACHABLE METER BAR models available for both 6- and 11¼-inch connection centers.



CHECK THESE QUALITY FEATURES!

- Compact design reduces meter set assembly costs — elbow-type cast iron head simplifies piping connections.
- Relief valve stop assures relief valve operation under the most severe conditions.
- Extra-large ¾-inch weatherproof screened vent provided in four basic positions.
- Die-cast aluminum alloy body and top for ease in handling, shipping and setting.
- Brass orifice easily changed through inlet connection.
- 125 psi maximum inlet pressure. Springs available for outlet pressures from 5- to 15-inches w.c. Body sizes ¾- and 1-inch. Orifice sizes ⅛-, ³⁄₁₆-, ¼-, and ⁵⁄₁₆-inches.

AMERICAN METER COMPANY

INCORPORATED (ESTABLISHED 1836)

General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

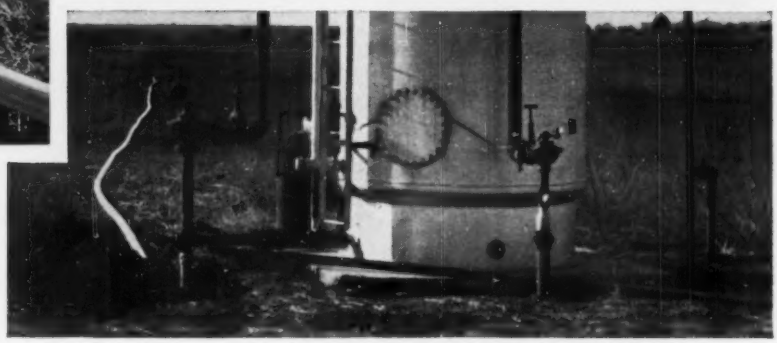
SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

News about

B.F.Goodrich Chemical *raw materials*

Geon pipe running to tank battery and water separator in distance is concealed by freshly covered-over trench. Geon pipe is being used for oil and gas lead lines up to 250 psi working pressures.

Three-inch Geon pipe leads through fitting made of Geon into 4-inch salt water disposal pipe, also made of Geon.



Three-inch Geon pipe carries salt water from a crude oil de-watering tower to a disposal well 1000 feet away. It will be buried after a second line feeding into the disposal line is installed.

Hundreds of wells per year show how to . . .

save with pipe of Geon

Pipe made from Geon rigid vinyl saves time and work—it is so lightweight and easy to install. And maintenance costs are considerably lower.

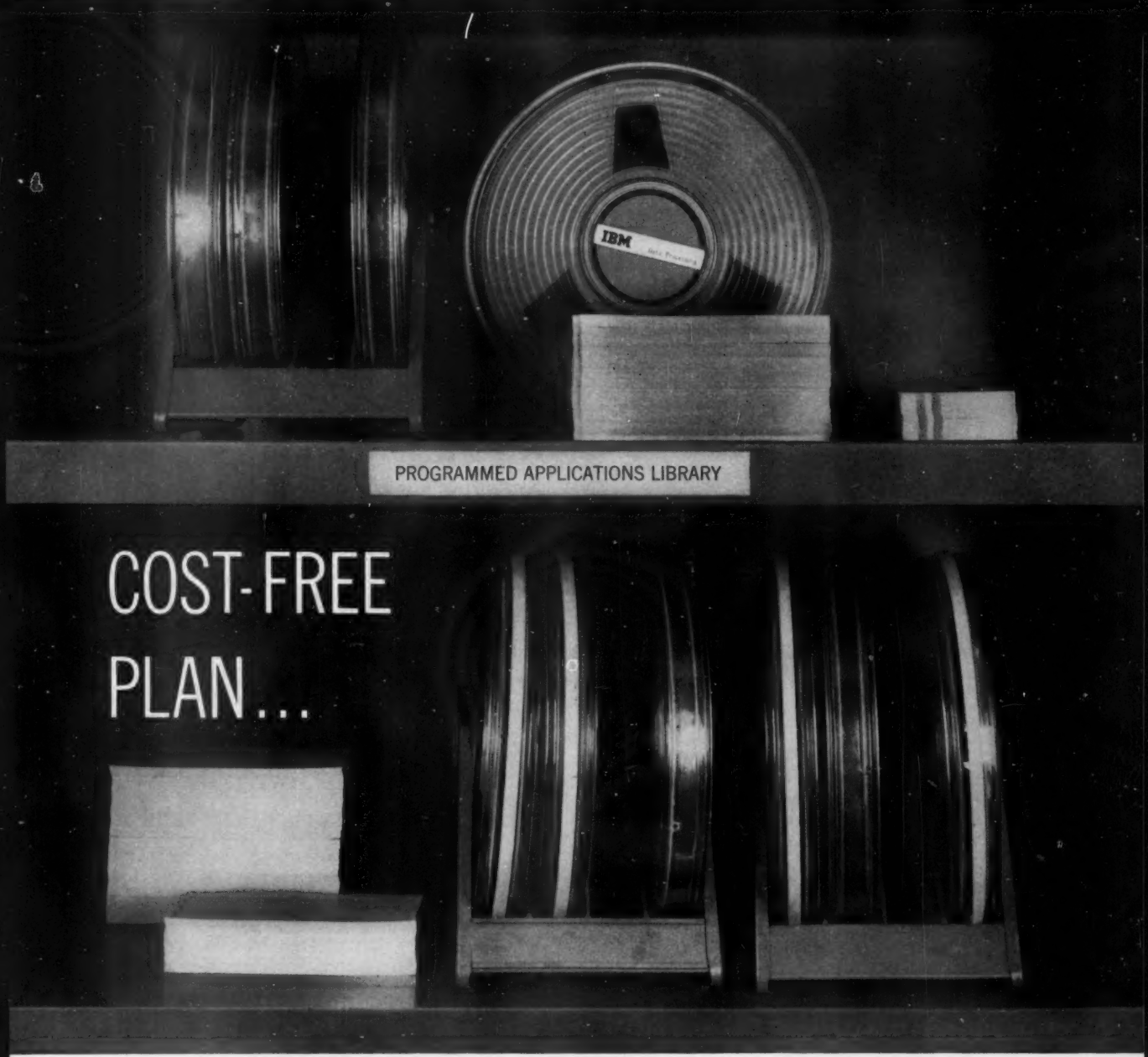
Pipe of Geon is immune to galvanic corrosion, is highly resistant both to salt water and sour crude oil. It stays smooth inside and out. And it provides high tensile or impact strength, standing up under pressure.

Engineers are taking advantage of the unique properties of Geon pipe for a wide variety of applications. For information on how you can cut costs by using pipe of Geon, write **Dept. GS-6,** B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon VINYLS

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers



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Your local IBM representative will be glad to show you a color movie demonstrating how this new IBM service can save you time and money—improve your customer accounting. Call him today.

*Customer Billing and Accounting on the IBM 7070 is another program from the expanding IBM Programmed Applications Library.

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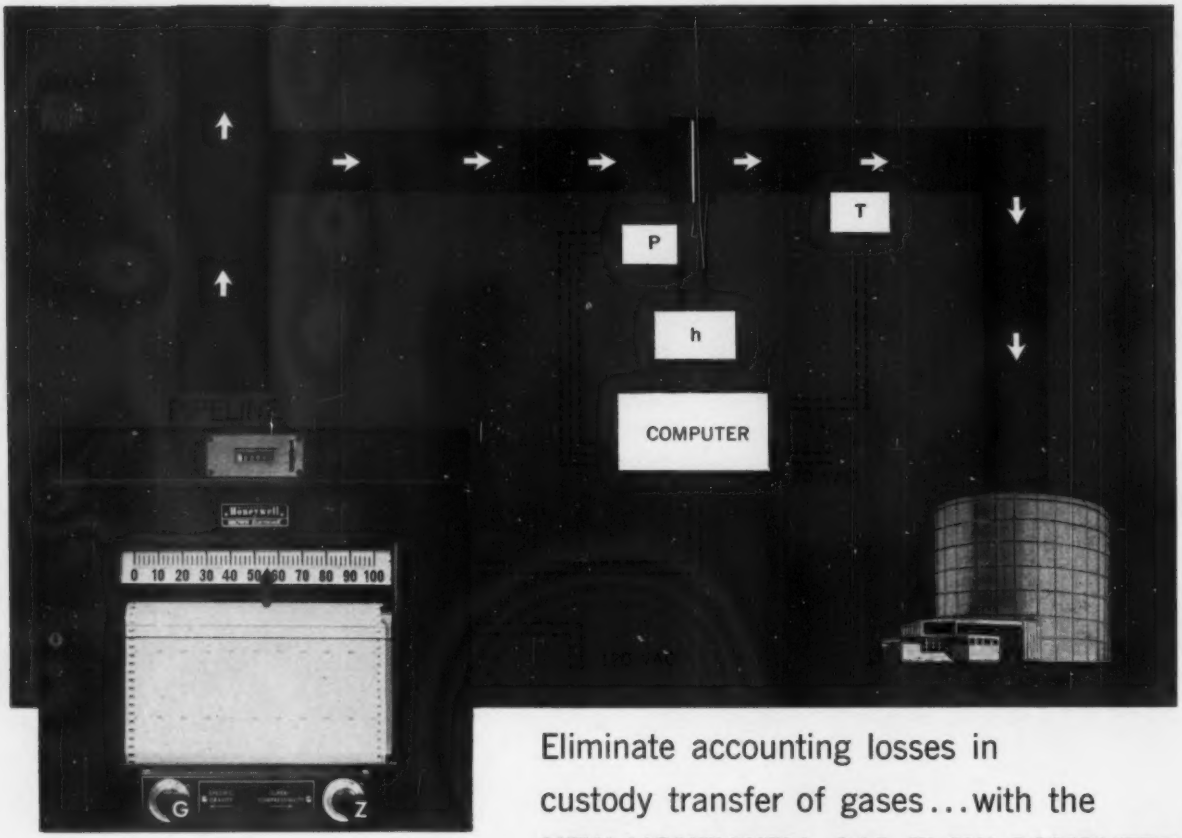


Eliminate accounting losses in custody transfer of gases...with the NEW HONEYWELL GAS FLOW COMPUTER

When you're selling or buying gas, even a slight inaccuracy in flow measurement can mean the loss of many dollars. Prevent this loss with the accurate, all-electric gas flow computer. It measures, records, and totalizes *mass rate* of gas flow, automatically and continuously. Temperature and pressure variations are compensated for automatically—eliminating the inaccuracies of "averaging" and other methods of computation.

The gas flow computer does away with tedious, time-consuming calculations and the possibility of human error. In most applications, it will perform with accuracy of ±1%, and, under ideal conditions, with accuracy of ±½%. You can use this new computer to measure mass flow of natural gas, propane, butane and other hydrocarbons. And you can easily link it to telemetering and remote control systems, supervisory control, data handling, and industrial process computers. Cost of the computer in most installations runs less than $4000.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Here's how the Honeywell gas flow computer solves a gas flow equation:

$$Q = K\sqrt{\frac{hP}{TGZ}}$$

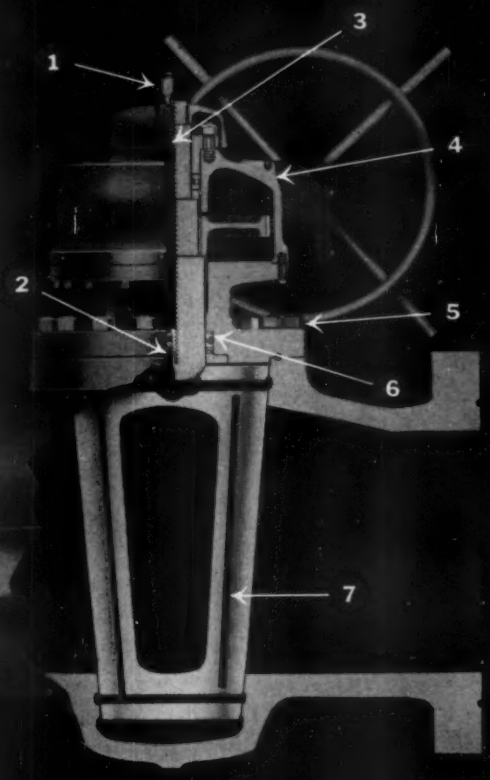
Where **Q** = mass rate of flow, scfh
h = differential pressure, inches of water
P = static pressure, psia
T = flowing temperature, °R, (°F + 460)
G = specific gravity
Z = super-compressibility
K = orifice flow constant

The *ElectriK Tel-O-Set* △P/I transmitter measures *h*; an absolute pressure transducer measures *P*; and a resistance thermometer bulb measures *T*. The analog computer multiplies *h* by *P* and divides by *T* . . . and sends a resultant millivoltage to the *ElectroniK* recorder. The recorder applies the correction factors G and *Z*, extracts the square root, and records the resultant mass flow Q.

75th YEAR — PIONEERING THE FUTURE

Honeywell
First in Control
SINCE 1885

7 characteristics that make WALWORTH a better Lubricated Plug Valve



1. Valve can be lubricated with a Walworth High Pressure Lubricant Gun without removing lubricant fitting.

2. Double ball check valve prevents line pressure from getting into lubricant system.

3. Groove, cut part way up side of lubricating fitting, provides extra safety feature by allowing operator to note any tendency of lubricant to blow out before fitting is entirely removed.

4. For buried pipelines—gear housing design permits simple attachment of lubrication and handwheel extensions without modifying the gearcase.

5. Standard bolt threads, rather than fine threads, means easy replacement of nuts and bolts from local stocks.

6. Two overlapping Teflon* packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low break-out torque—plug turns easier.

7. Vertical and circumferential lubricant grooves completely frame the port openings, assuring a tight seal against leaks.

*Du Pont registered trade-mark

Cutaway of a 24-inch Walworth Lubricated Plug Valve

you always know that a WALWORTH LUBRICATED PLUG VALVE will operate

No matter when you need it, you can count on a Walworth LPV to operate easily and dependably in handling gas, crude or finished products. In petroleum service throughout the world, these valves have long proved their complete dependability and easy maintenance. Walworth also designs and manufactures Gate, Globe, Angle and Check Valves for the oil and gas industries. For information, write Walworth Company, Lubricated Plug Valve Division, 3517 Polk Avenue, Houston 23, Texas.

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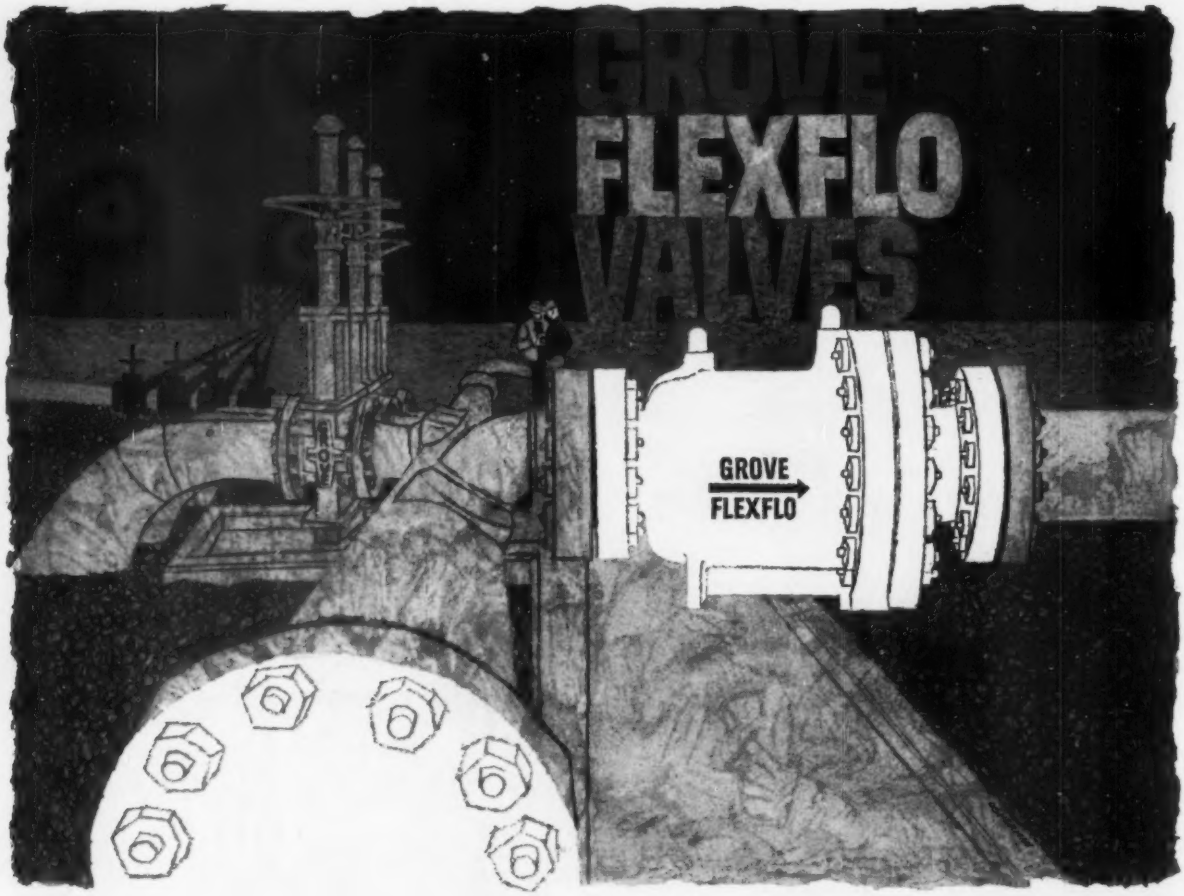
WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. M&H VALVE & FITTINGS CO. • SOUTHWEST FABRICATING & WELDING CO., INC. • WALWORTH COMPANY OF CANADA, LTD.



CHOICE OF EVERY MAJOR U.S. GAS DISTRIBUTION COMPANY

DEPENDABLE Assured by unique simplicity of design and construction. Only one moving part, a tough, resilient rubber tube that can never stick or wedge, serves as both diaphragm and valve.

QUIET There is no "slamming". The rubber tube silently rolls on and off the slotted metal body core. Actually, the quietest valve you can use.

VERSATILE Use for pressure reducing, remote control operations, back pressure control, automatic shut-off and manual open-shut flow control. May be self operated or used with electrical, pneumatic or hydraulic actuated pilots. Can handle gas, water, most petroleum products. Available in sizes 1" to 12", working pressures to 1500 psi.

write for technical data bulletins

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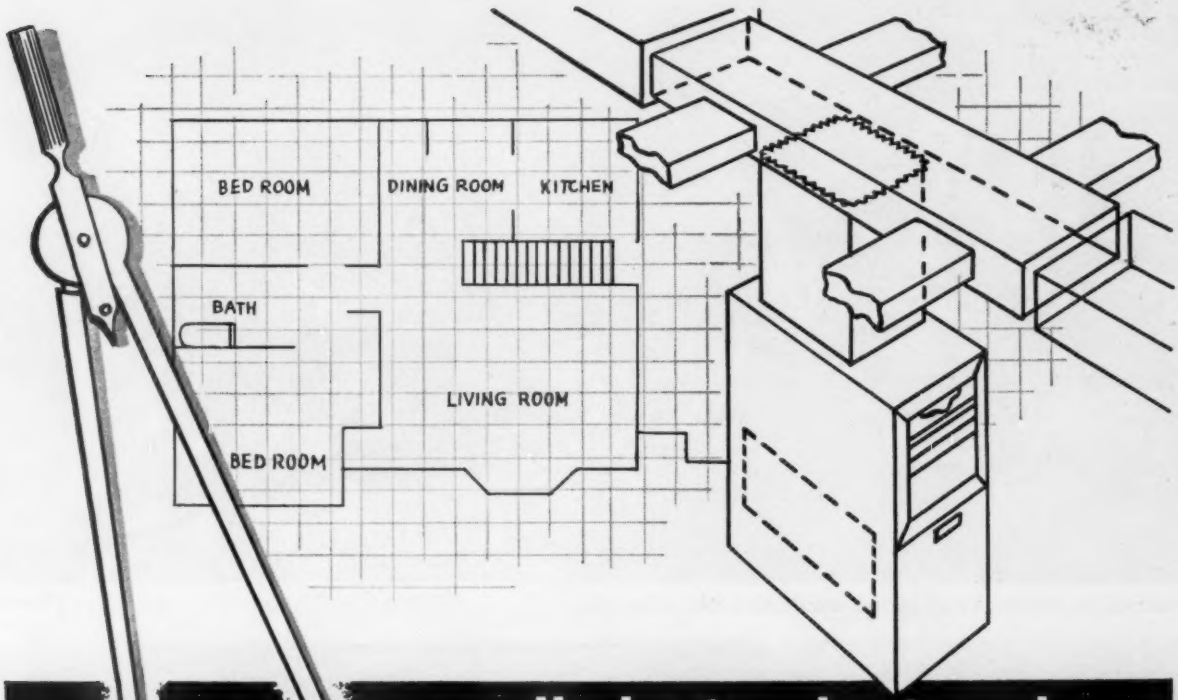
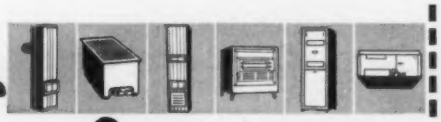
GROVE VALVE AND REGULATOR COMPANY
A Subsidiary of Walworth
6529 Hollis Street, Oakland 8, California
Offices in principal cities throughout the U.S.
In Western Canada: Grove Valve Ltd., Edmonton 6323



eliminate ductwork installation problems!

when you use Empire Furnaces

Now get the complete package! Empire's free layout service tells you how to quickly and economically install an Empire central heating system... everything necessary for a complete installation ... size of Empire heating unit and the necessary Empire Redi-Pak ductwork.



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Manufacturers of the finest complete line of Certified Gas heating appliances

MEMBER NATIONAL LP-GAS ASSN. INC.

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Quick! Send more details on Empire Redi-Pak Ductwork

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advance the gas flame everywhere

Unmatched reach in each digging class with Ford 10′, 12′, 14′ backhoes.

Excellent flush digging close to walls, footings.

Pinpoint bucket control for speed, accuracy.

Strong swing, even on uphill slopes.

Easy pipe handling, a bonus for line work.

NAME YOUR NEED!
FORD BACKHOES EXCEL AT ANY JOB!

1801 Industrial Package

A production champ from any angle. The beefy industrial tractor is built to "take it," has plenty of power. Ford's schedule-beating 12 ft. and 14 ft. backhoes team up with Ford's big 2,500 lb. capacity Super-Duty loader for fore-and-aft productivity that tops any other rig in this power class.

Fordson Power Major Package

Big, rugged, economical diesel power for Ford's bigger backhoes and Super-Duty loader. Fordson tractors have long been noted all over the world for simple, dependable design and ever-scrimpin' fuel economy. Now, Ford-matched industrial equipment gives Fordson more dig-and-load capacity than ever before.

Workmaster or Powermaster Package

Ford's versatile 601 and 801 all purpose tractors provide low cost power for 10 ft. or 12 ft. backhoes and Extra Heavy Duty loader. All Ford tractors including industrial models are available with choice of gasoline or diesel engines, choice of work-saving transmissions and many other options. Your Ford dealer can advise you on the best money-saving, money-making tractor-loader-backhoe combination for *your* job. Stop in and see him soon, or write Industrial Tractor and Equipment Department, Ford Motor Company, Birmingham, Michigan.

Ford Motor Company

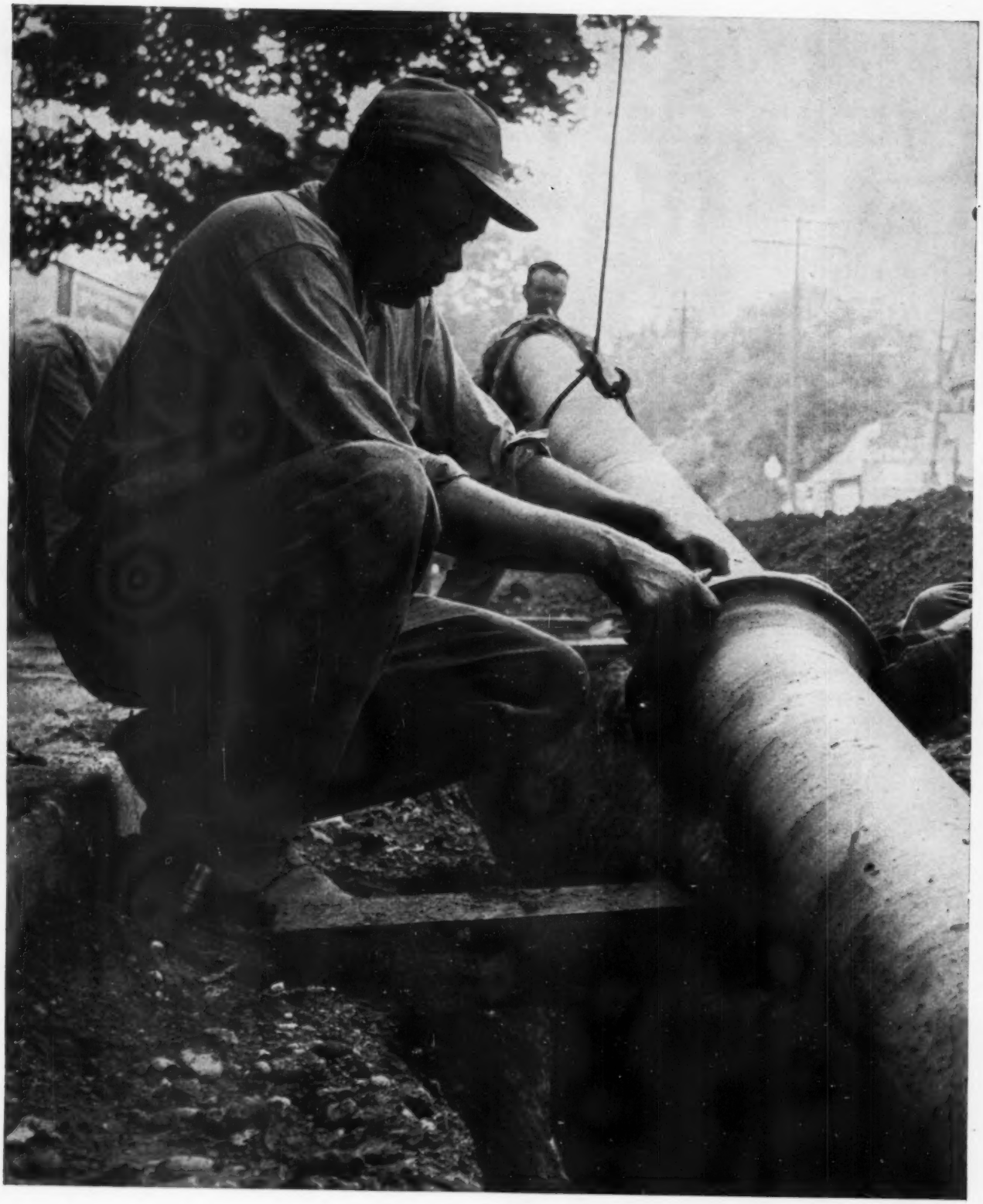
FORD

TRACTORS AND EQUIPMENT FOR 101 INDUSTRIAL JOBS

Unmatched undercutting, true of every model.

Tight quarters pose no problem with Ford.

Super lift capacity adds to odd-job versatility.



PREVENTING LEAK-REPAIRS BY PREVENTING THE LEAK

The cast iron pipe gas main you see at the left will handle a mixed manufactured and natural gas at normal pressure for a large gas utility. You will note that the crew is assembling the joints *before* placing the pipe in its trench.

This utility has been installing cast iron pipe in this manner for years. They have never had a leak. Possibly, they may never have one.

The easy-to-assemble mechanical joint, a standout cast iron pipe feature, seals so tightly that, under normal distribution pressures, many gas utilities look to cast iron pipe as the "ounce of leak-prevention that's worth a pound of cure."

That's the remarkable thing about cast iron pipe: it rarely needs attention after installation. In fact, 62 American cities are still using cast iron gas mains that were installed over a century ago.

CAST IRON PIPE RESEARCH ASSOCIATION
Thos. F. Wolfe, Managing Director,
3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE
THE MARK OF THE 100-YEAR PIPE

...AT NO EXTRA COST!

21% MORE ELBOW

Compare these money-saving Midwest Long Tangent elbows (one of five types offered) with ordinary long radius ells! The Long Tangent type provides 21% greater length on 90° ells, 42% more on 45° ells. Only Midwest gives you this bonus *at no extra cost!*

Long Tangent elbows save time and money in many ways: (1) they save on pipe; (2) they save by eliminating short nipples and extra welds; (3) they save time in applying slip-on flanges or sleeves; (4) they save time in lining-up and clamping pipe; and (5) it is easier to replace an ordinary ell with a Midwest Long Tangent than with another ASA ell.

Only Midwest manufactures and stocks Long Tangent ells in a complete size range through 36". Also available with special tangent lengths at slight additional charge.

Write for catalog which shows complete selection of Midwest welded-type and seamless fittings.

Sold through Stocking Distributors from Coast to Coast

MIDWEST

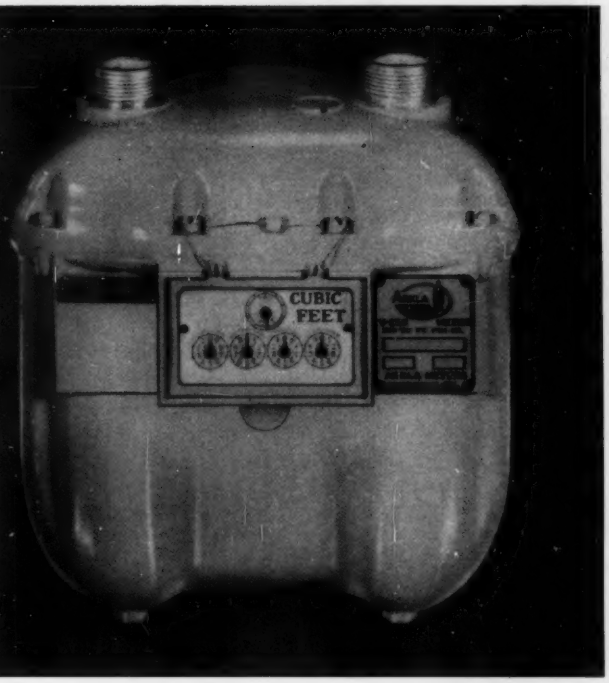
MIDWEST PIPING COMPANY, INC.
1450 S. Second Street St. Louis 4, Missouri

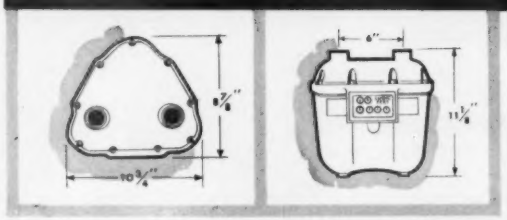
THE WORLD'S MOST COMPLETE LINE— SEAMLESS AND WELDED-TYPE FITTINGS

THE ARKLA

V 250

GAS METER





Dimensions: The Arkla V250 Gas Meter weighs less and is smaller than any other 250 cu. ft./hr. gas meter.

A NEW, COMPACT, ACCURATE "CASH REGISTER" FOR THE GAS INDUSTRY!

EXCELLENT ENGINEERING AND DESIGN of this gas meter, first of a new, modern line, are evident in its light weight and compactness that make the Arkla V250 Gas Meter easy to install... fewer moving parts reduce maintenance... accuracy of the Arkla V250 Gas Meter makes it a welcome "cash register" for the gas industry.

Order ARKLA V250 GAS METERS TODAY. *(Other models available soon.) For further information, write or call us, or ask your Arkla-Reynolds Gas Regulator representative.*

ARKLA

WRITE OR CALL:

ARKLA METERS, Evansville, Ind. Fla. & Oregon Ill.

A Division of Arkla Air Conditioning Corporation

1961's GREATEST SHOW ON WORTH!!!

1961 CHEVROLET STURDI-BILT TRUCKS! PROVED WORTH MORE BECAUSE THEY WORK MORE

A gigantic advance in trucking began just a year ago, when the first Torsion-Spring Chevy nosed out onto a highway. With a vastly different truck design, featuring torsion-bar independent suspension, this totally new Chevy did just about everything better. And it caught on fast. So fast, in fact, that already there are nearly 300,000 Torsion-Spring Chevies putting out this new kind of working ability on tough jobs all over America. Now, for 1961, Chevrolet introduces trucks with even more of the worth-more, work-more performance that's won such wide owner acclaim over the past year. Even more strength, even more stamina—and an even wider range of models!

MORE MODELS THAN EVER BEFORE! 189 models—work-proved dollar savers in every weight class! 1961 Chevies for every hauling chore in the book include three new long-wheelbase 4-wheel drive models, sturdy Stepside and Fleetside pickups, spacious panels, versatile Suburban Carryalls, handy Step-Vans and forward control chassis, tough chassis-cabs of all sizes, mountain-moving tandems. Somewhere in this long, *long* line is the one truck that makes the most sense on your job!

OWNER-PROVED TORSION-SPRING RIDE! It puts an end to I-beam axle shimmy! Independently suspended front wheels step right over bumps, tough torsion-bar springs soak up jolts. New smoothness speeds up schedules, cuts truck wear and maintenance expense, reduces cargo damage and driver fatigue. Owners report that there's never been anything like it for high-profit hauling!

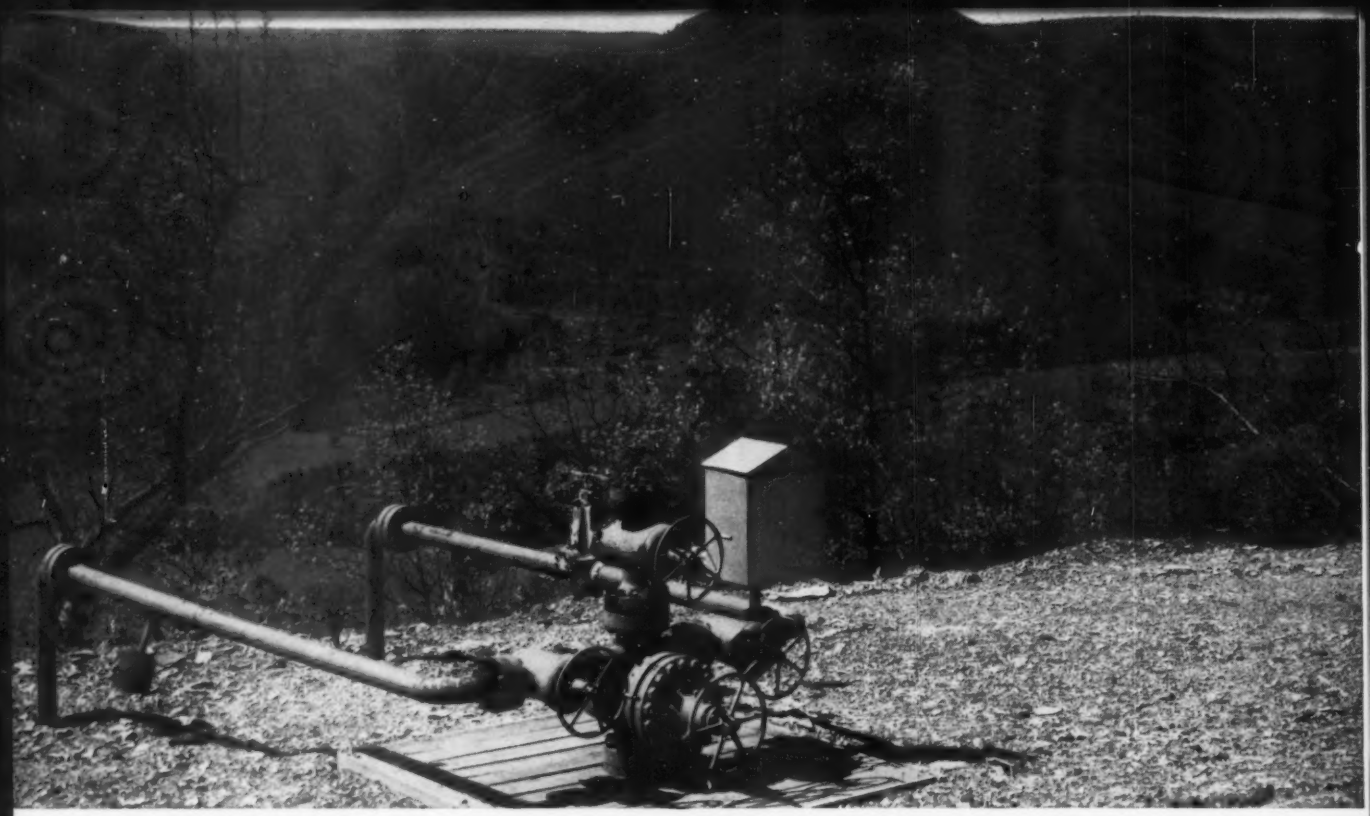
STRONG, ROOMY CABS THAT HELP BOOST YOUR WORK OUTPUT! Rangy drivers ride in comfort with extra hip room, leg room and head room. Seeing is safe and easy through a whopping big wraparound windshield. The seat's a beauty, too—a full 59½" wide with a spring combination inside that gives just the right support. (And for the last word in working comfort, special 6" foam rubber padding is optional at extra cost.) And the *rugged* cab build includes all-steel construction, double-panel roof and double-walled cowl housing.

TOUGH TRUCK CHASSIS—BRAWNY BASIS FOR BIGGER PROFITS. Massive, truck-built frames add stamina to every chassis. In medium- and heavy-duty models, rugged self-adjusting variable-rate rear springs help smooth out big-tonnage hauls. Quality features galore boost truck life: Extra-big brakes give faster, surer stops and last longer. Precision wheel balance makes steering easier, lengthens tire life. Smooth, durable Synchro-Mesh transmissions come in sizes to suit all types of duty.

ENGINES WITH PROVED EARNING POWER. Famous sixes that out-sell all others because they're best at brightening cost records . . . big V8's that lead the industry for short-stroke design and hard-working durability! Chevy for '61 offers a *long* line of power plants to meet the special needs of every weight class.

The truth is, we could fill every page in this magazine with reasons why Chevrolet trucks have never been better than they are for '61, but there's no need for that. Not when your Chevrolet dealer can boil it all down for you so quickly and pleasantly. See him soon and start saving soon! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET



This National Supply wellhead is in operation on the LW-4 well in the Leidy gas storage field. Ultimately, the pool will store 105.7 billion cubic feet of gas for use by New York State Natural Gas Corporation, Transcontinental Gas Pipeline Corporation and the Texas Eastern Transmission Corporation. New York Natural will operate the facility.

Facts about new Leidy Storage Pool:

will store 105 billion cubic feet of gas
will operate under 4,000 pounds of pressure
will depend on 93 National Supply Wellheads

The famous Leidy gas pool is back in the news. A huge gas storage pool is being developed in this north-central Pennsylvania area to serve markets in Pennsylvania, New York and New Jersey.

When completed, the gas pool will be capable of holding 105.7 billion cubic feet of natural gas, including the 45 billion feet of cushion gas.

National Supply has furnished most of the wellheads for this vital new pool, which will be operated at a maximum of 4,000 pounds for storage, the greatest operating pressure of any pool ever developed.

There are many reasons why you usually find National Supply wellhead equipment at important installations such as this Leidy pool.

Pressures up to 4,000 pounds p.s.i. require the heavy duty piping and massive valves of this National Supply wellhead in the Leidy field.

National Supply manufactures a complete line of wellhead assemblies and is fully staffed to service all this equipment in the field. National Supply can design and supply complete wellheads to solve any of your special problems . . . whether they be with tubing hangers, bonnets, valves, flanged and threaded fittings, adjustable chokes and flow beans, flow assemblies, flow controls or specialty items.

For complete information, call your nearby National Supply store, or write to the address shown below.

Steel's Symbol of strength, long life, and economy

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation

See the color film on world's first quintuple string producing well!

National Supply recently designed and assembled the wellhead for the industry's first five-string gas well. A 20-minute color sound film showing this completion is available for group showings. If your group would like to see this film, please write to Sales Manager, Production Equipment, The National Supply Company, Pittsburgh 22, Pennsylvania.

GAS

NOVEMBER 1960

Phillips Decision

Ushers in Area-pricing Era

A NEW era dawned over independent gas producers on Sept. 28, 1960. On that date the Federal Power Commission issued its opinion in the landmark Phillips Petroleum Co. case.

While the commission had to use the traditional rate base method for Phillips, in a separate "Statement of General Policy No. 61-1" a system of area field prices was instituted. By this statement the FPC set standards for new and increased rate filings by gas producers selling their gas in interstate commerce. These standards will serve as a guide to FPC and to interested parties in determining whether proposed initial rates should be certificated without a price condition and whether proposed rate changes should be accepted or suspended.

FPC set up geographical areas in gas producing states so as to be "convenient and well known." Two price standards have been set for each area. One pertains to initial prices in new contracts. The other is applicable to escalated prices in existing contracts. The new contract rates are termed "Initial Service Rates" and the escalated prices are referred to as "Increased Rates."

FPC considered the following factors in setting the price levels for the various levels: cost information from all decided and pending cases, existing and historical price structures, volume of production, trends in production, price trends in the various areas over a number of years, trends in exploration and development, trends in demands, and the available markets for the gas. The commission did not detail the adjustments that must be made to these area prices due to gas quality, conditions of delivery, etc.

Rather, the Statement of General Policy said: "The relevance of such adjustments to the basic contract price and the appropriate established price standard must be considered as each filing is made. As it becomes apparent that certain adjustments have general applicability in a specific area, the area price standard will be revived and set forth in greater detail with regard to the exact sale conditions to which the rate applies. We should, however, make it clear that these present price standards apply to pipeline quality gas as that term is generally understood in each area and, except for the Louisiana prices, are inclusive of all taxes."

The Louisiana Gulf Coast was not assigned an initial price level as that price level there is currently the subject of two hearings pursuant to Supreme Court decisions. Said FPC: "Clearly, in light of these cases, it would not be proper at this time for us to establish an initial rate level for these areas prior to a final determination of these cases."

The listed area prices are for FPC's "guidance and initial decision." They do not, however, cut off any producer's rights as to ultimate just and reasonable rates. So, for the time being, in the absence of compelling evidence calling for some other price, the respective initial prices are limits of what FPC will certificate without condition. Similarly, rate changes filed under existing contracts which call for a rate exceeding the FPC-set area price levels will be suspended.

Industry reaction to the area pricing concept was mixed. Some gas companies considered the FPC's system as representing a victory for gas consumers.

Nearly all segments felt that area pricing will have a stabilizing influence over the long run and that any such factor should be welcomed. However, there was also a feeling voiced that the two price levels might result in placing established, well matured gas pipeline companies at something of a disadvantage. Also, there was a feeling that FPC will have to give more regard to gas quality.

The commission said it had learned from the Phillips case and many other producer rate cases of the past five years that the . . . "traditional original cost, prudent investment rate base method of regulating utilities is not a sensible, or even workable method of fixing the rates of independent producers of natural gas."

The FPC pointed out that it has 3372 independent producers who have rates on file. There are in addition some 15,435 non-filing co-owners whose rights should also be considered under any rate base theory. At the time of the Phillips opinion, about 570 producers were involved in 3278 producer rate increase filings now under suspension and waiting for hearings and decisions.

Taking into account these cases and new ones they feel would be filed in the period necessary for the present staff to whittle present producer cases down, FPC estimated that if the present staff was tripled, independent producer rate work would not be caught up with until 2043—or 82.5 years from now.

FPC proposes to revise the area price levels from time to time. Other revisions and refinements will undoubtedly have to be made. But the ultimate objective will be to set prices in all producing areas which will be adequate to maintain the gas supplies needed by consumers of the nation, but at prices that are no higher than are necessary to accomplish that purpose.

In the Phillips opinion, FPC further stated that:

"We fully realize that some persons will contend that the plan of rate regulation we here announce is not lawful and that we are bound by *City of Detroit v. F. P. C.* to calculate a rate base and determine a rate of return, at least as a point of departure. If this contention is correct, then, as a practical matter, adequate regulation of producers appears to be impossible under existing law.

"We realize that any decision we make in this and similar cases will be subjected to the lengthy processes of court review. However, in the absence of the appropriate congressional legislation the resultant delay and uncertainty is an unavoidable hazard."

Turning specifically to the Phillips case, FPC said it had to use the rate base approach because the evidence was presented on a cost basis. But it also said that "ridiculous" results would be reached in a great number of cases if costs should be the only basis for regulation. It felt that the ultimate solution to independent gas producers rate regulation lies in the determination of fair prices for gas, based on reasonable financial requirements of the industry, and not on the rate base and expenses of each company.

The FPC allowed Phillips an 11 per cent rate of return. They did not set forth as a specific item in the cost of service the tax incentives arising from the 27.5 per cent statutory depletion allowance and the expensing of intangible well-drilling costs.

FPC adopted a modified Btu method of allocating exploration costs between Phillips' oil and gas. The method is based on the relative heating value of the oil and gas produced by the company in the test year.

Then the commission accepted Phillips' contention that it should be permitted to adjust its purchased gas costs to reflect the higher prices it will have to pay for gas it buys from other producers because of its own rate increases resulting from these proceedings. Under escalation provisions in Phillips' contracts, its cost of gas rises automatically if it is allowed to increase its rates.

Citing the necessity for producers to acquire additional reserves, FPC permitted Phillips to include in its 1954 rate base certain amouunts representing undeveloped offshore leases held by a subsidiary as well as other undeveloped leases, even though there was no production.

Commission members participating in the Phillips opinion were Chairman Jerome K. Kuykendall, Commissioner Frederick Stueck and Commissioner Arthur Kline. The latter concurred in part and dissented in part. Commissioner Paul A. Sweeney, who took office July 15, did not participate. ■

AREA PRICE LEVELS FOR NATURAL GAS SALES BY INDEPENDENT PRODUCERS

(ALL RATES AT 14.65 psia)

AREA	INITIAL SERVICE RATES/Mcf	INCREASED RATES/Mcf
Texas		
District No. 1	15.0¢	14.0¢
District No. 2	18.0¢	14.0¢
District No. 3	18.0¢	14.0¢
District No. 4	18.0¢	14.0¢
District No. 5	14.0¢	14.0¢
District No. 6	15.0¢	14.0¢
District No. 7-b	14.0¢	11.0¢
District No. 7-c	16.0¢	11.0¢
District No. 8	16.0¢	11.0¢
District No. 9	14.0¢	14.0¢
District No. 10	17.0¢	11.0¢
Louisiana		
Southern	not determined	13.7¢ (14.0¢ at 15.025 psia)
Northern	16.6¢ (17.0¢ at 15.025 psia)	13.7¢ (14.0¢ at 15.025 psia)
Mississippi	not determined	13.7¢ (14.0¢ at 15.025 psia)
Oklahoma		
Panhandle Area	17.0¢	11.0¢
Other	15.0¢	11.0¢
Carter-Knox	16.8¢	11.0¢
Kansas	16.0¢	11.0¢
New Mexico		
Permian Basin	16.0¢	11.0¢
San Juan Basin	12.7¢ (13.0¢ at 15.025 psia)	12.7¢ (13.0¢ at 15.025 psia)
Colorado	14.6¢ (15.0¢ at 15.025 psia)	12.7¢ (13.0¢ at 15.025 psia)
Wyoming	15.0¢	12.7¢ (13.0¢ at 15.025 psia)
West Virginia	26.8¢ (28.0¢ at 15.325 psia)	23.9¢ (25.0¢ at 15.325 psia)

In July 1957, L. L. Newman, chief coal technologist, Bureau of Mines, U. S. Department of the Interior, served as a member of the Minnesota Peat Mission to the U. S. S. R. The primary purpose of the mission was to study the winning of peat and its utilization in the agricultural and energy economies of the Soviet Union.

In Mr. Newman's words: "Because of my interest in the gas industry, in addition to reviewing the role of peat in gas manufacture, I took the opportunity to visit the Podmoskovnaya underground gasification station—then the largest establishment of its kind for gasifying unmined Moscow basin brown coal.

"No restriction seemed to be placed on the information requested by any member of the mission. The notes and documents collected in 1957, supplemented by a variety of articles in the technical press, including reports of the British, Belgian, and German mission on studies which they made on various phases of the Soviet gas operations, were freely drawn on for the preparation of this article."

The gas industry in the U.S.S.R.

By L. L. NEWMAN

THE earliest recorded use of gas in pre-revolutionary Russia was in 1819, three years after the first gas company in the United States was chartered in Baltimore. Its use, however, was for illuminating the General Staff Headquarters in St. Petersburg (Leningrad). It was not until 1835 that the Russian gas industry really began in that city with the distribution of gas produced by distilling coal imported from England.

The Moscow gas works was built in 1865. Others were installed in Riga, Vil'nius, Tver', Odessa, Kronstadt, Taganrog, Khar'kov, Kiev, Kazan, and Rostov-on-the-Don during the period 1861-1882.

In 1910 there were 23 gas works in Russia, engaged primarily in producing gas for illuminating streets and railroad stations. Domestic consumption was limited by the high cost of the gas. For example, the number of domestic consumers at the outbreak of World War I was about 10,000 in St. Petersburg and

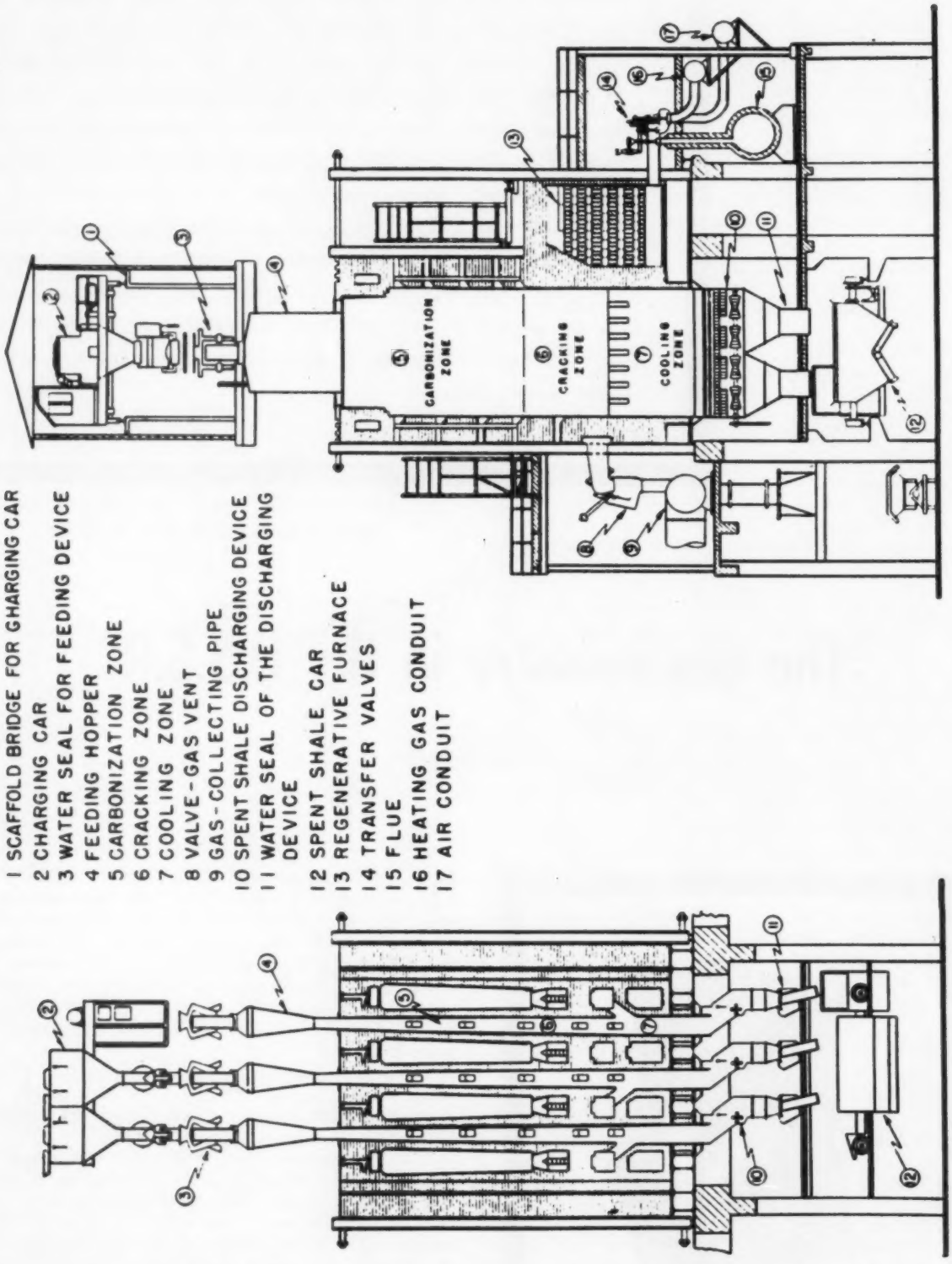


Fig. 1. Sectional views of a battery of continuous vertical retorts for oil-shale gasification.

only 2700 in Moscow.

The development of the Soviet gas industry in the larger cities is typified by the growth in the gas consumption in Leningrad. This increased from an average of less than 1.5 MMcf of gas per day in 1913 to about 6 million in 1940. After receiving a serious setback during the siege of the city in World War II, the average consumption climbed back to about 2.5 MMcfd in 1946, to more than 4 million in 1947, and to 7 million in 1948. It was doubled in 1949 when gas from the new oil-shale gasification plants in Estonia became available. Thereafter the growth continued steadily at an average annual increase of 9 MMcfd, until, in 1956, the average daily consumption reached 78 million.

The total quantity of gas supplied to the city of Leningrad in 1956 was 28.4 billion cu ft, having an average calorific value of 420 Btu per cubic foot. The city received 15 per cent of its gas requirements from the Leningrad coke plant, which has an annual capacity of 4.6 billion cu ft, and the remainder from the Kokhtla Yarva shale gasification plant in Estonia, and the Slantsy shale gasification plant in the Leningrad Oblast', each with an annual capacity of 15.2 billion cu ft.

The sale is gasified in continuous vertical retorts (*Fig. 1*), designed so that the distillation products must flow past the hot, spent shale and be subjected to cracking before entering the gas offtake near the base of the retort. Consequently, the offtake gases are composed principally of non-condensible gases. The retorts are heated by the combustion of lean gases generated in Pintsch producers modified for oil-shale gasification (*Fig. 2*).

Plans call for enlarging the Kokhtla Yarva shale plant to provide an additional 2 billion cu ft annually by the end of this year and for the completion this year of a new shale gasification plant at Ahtme with an annual capacity of 15.2 billion cu ft.

By the end of 1962, according to the plan, another shale plant will be completed at Narva with an annual output of 60 billion cu ft, and a natural gas pipeline will be built from Dashava, capable of delivering an additional 190 billion cu ft annually. The anticipated average daily demand is 285 MMcf in 1960, 325 MMcf in 1961, and 355 MMcf in 1962.

The plan calls for raising the calorific value of the gas to 830 Btu per cubic foot after 1963. This will be possible as a result of the arrival of natural gas from Krasnodar in the North Caucasus. The proposed pipeline will have a daily capacity of 400 MMcf. This facility added to the existing facilities will be ample to take care of the projected average daily demand of 500 MMcf in 1963, 650 MMcf in 1965, and 720 MMcf in 1967.

This incredibly high rate of increase in demand is projected on the basis of replacing all solid and liquid fuels for domestic heating in Leningrad within this decade.

Coal, instead of shale, has been the principal raw material for manufactured gas in other urban centers. Except for this difference, the pattern described for Leningrad has been similar elsewhere. As rapidly as pipelines could be built, natural gas began to supplement the supply of manufactured gas, later becoming the dominant element in the total supply. Moscow, for example, gets about 10 per cent of its gas supply from a coke plant in nearby Rasturzhevo and from a low-temperature brown coal distillation plant in Tula, some 150 miles south of the city. The remainder is

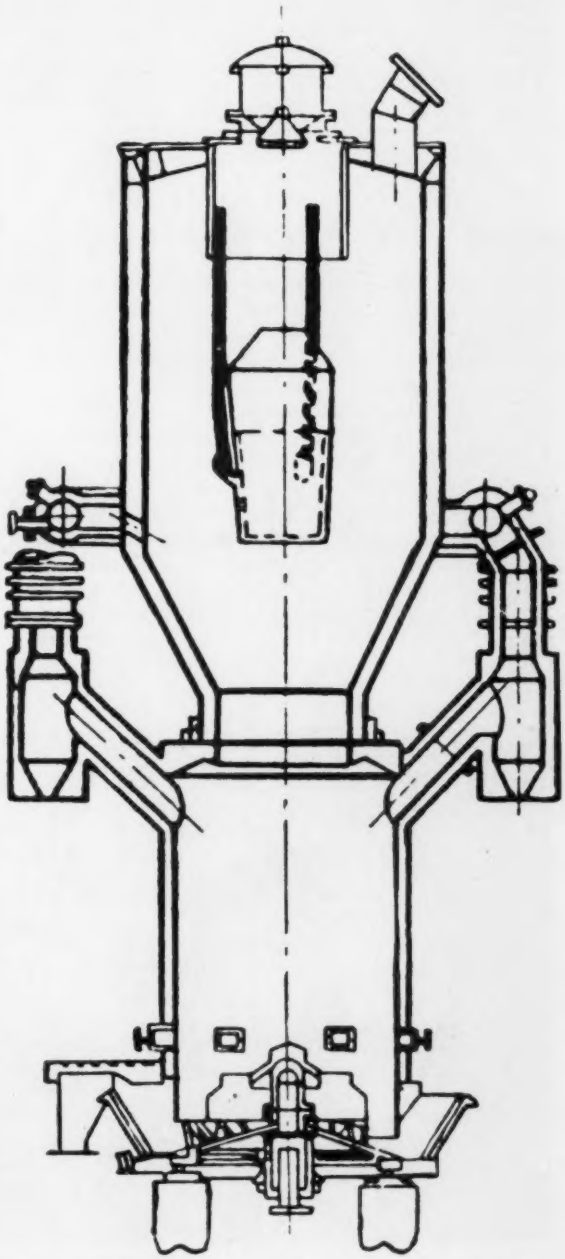


Fig. 2. Pintsch producer modified for oil-shale gasification.

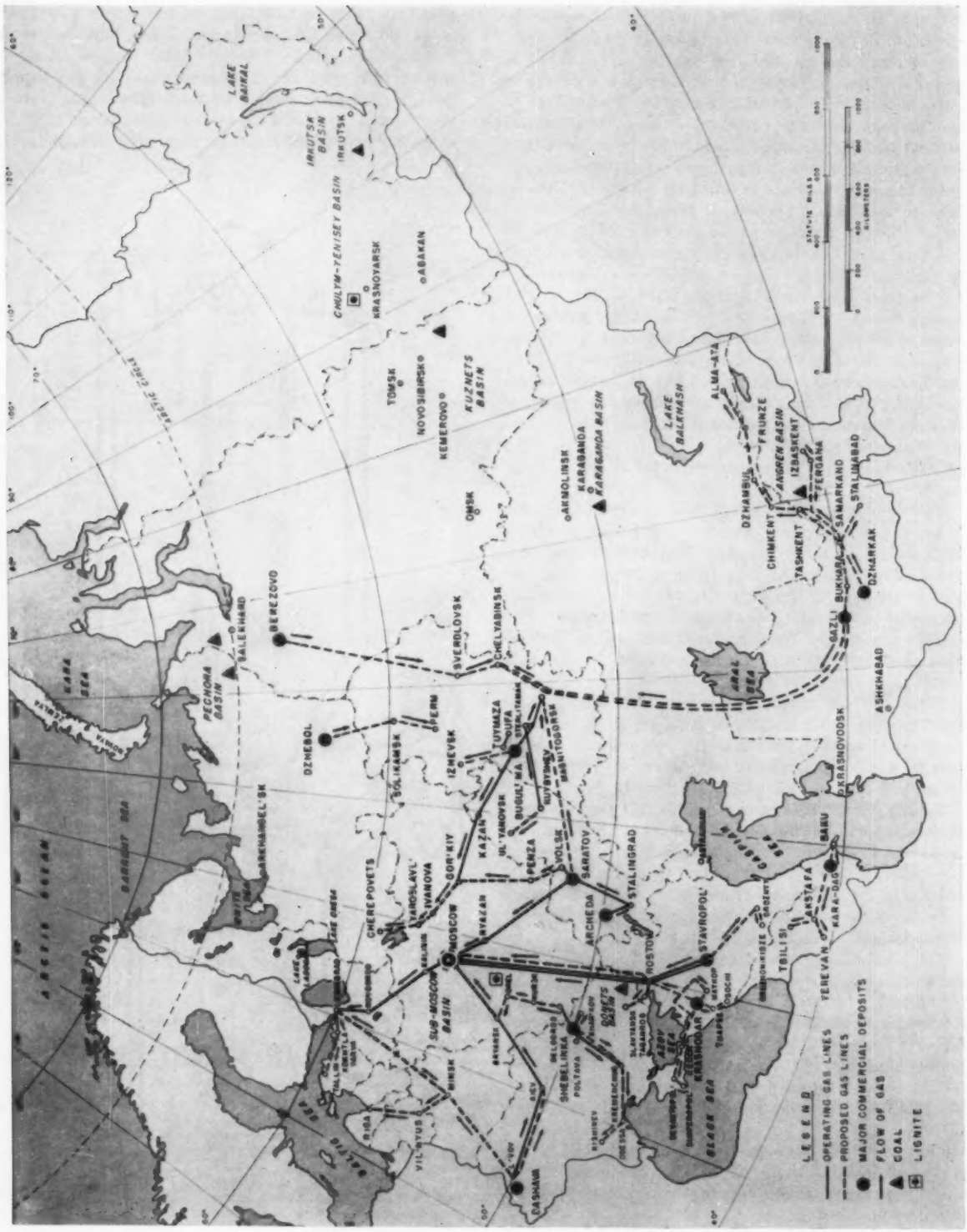


Fig. 3. Natural gas pipelines in the U.S.S.R.

TABLE 1—Actual (1957 and 1958) and projected production gas by underground gasification processes in the U.S.S.R.

Station	Production, billion cu ft of 90 Btu gas								
	1957	1958	1959	1960	1961	1962	1963	1964	1965
Podmoskovnaya at Tula (Moscow basin, brown coal)	15.5	15.5	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Lisichansk (Donets basin, bituminous coal)	3.8	3.8	5.3	6.5	7.6	7.6	7.6	7.6	7.6
Yuzhno-Abinsk (Kuznets basin, bituminous coal)	4.6	4.6	7.6	15.2	22.8	30.4	38.0	57.0	76.0
Shatsk (Moscow basin, brown coal)	—	5.2	9.8	15.2	22.8	30.4	38.0	38.0	38.0
Angren (Uzbekistan, Angren deposit, lignite)	—	—	7.6	17.1	30.4	60.8	83.5	88.2	88.2
Kamensk (Donets basin, semianthracite)	—	—	—	1.9	3.8	7.6	10.5	13.7	13.7
Stalinsk (Kuznets, semianthracite)	—	—	—	—	—	—	—	7.6	114.0
Kolmogorovo (Kuznets, bituminous coal)	—	—	—	—	—	—	—	11.4	137.0
Total (billion cubic feet)	23.9	29.1	45.9	71.5	103.0	152.4	193.2	239.1	490.1
Total (million therms)	21.5	26.2	41.4	64.4	92.8	137.3	174.2	215.5	431.1

natural gas.

Glavgaz, the main administration of the gas industry, has announced that it plans to replace by 1970 all other domestic heating fuels with gas in all the large metropolitan centers. This predicates an enormous rate of increase in the production of natural gas and its transmission over long distances. The overall plan for 1965 provides for an annual production of 5.5 trillion cu ft of gas and a network of pipelines aggregating about 25,000 miles. Every major industrial region, except the Far East, will be receiving natural gas. Many areas west of the Ural mountains will be getting gas from two sources. Moscow is now receiving its gas from Saratov, Dashava, and Stavropol. The plan provides for serving about 60 million people in 500 cities and villages. The routes of the existing and projected natural gas pipelines are shown in *Fig. 3*.

In such a program, underground gasification, despite its high state of development in the Soviet Union, is of minor interest to the gas industry, simply because it is too expensive to transport 90 Btu gas over any but very short distances. Nevertheless, underground gasification has an important function to perform in the Soviet economy. The country is vast and has many regions rich in natural resources but remote from large supplies of electricity or natural gas. Underground gasification of local coal deposits, however lean the gas, can provide the energy needed to develop the new and promising industries that these resources may justify, far in advance of the arrival of the more conventional supplies of energy. So far,

TABLE 2—Production of energy in the U.S.S.R. and U.S.A. in 1957, and planned or projected for 1965, and implied

	Millions of therms				Percentage				Implied growth rate, percent per year	
	U. S. S. R.		U. S. A.		U. S. S. R.		U. S. A.			
	1957	1965	1957	1965	1957	1965	1957	1965	U. S. S. R.	U. S. A.
Natural gas	6,300	43,500	115,710	182,000	3.6	14.4	26.9	27.2	27.0	5.8
Coal	97,000	129,000	135,530	140,000	56.1	42.6	31.5	23.3	3.6	.4
Petroleum	38,000	86,900	151,780	203,000	21.9	28.7	35.3	43.1	10.8	3.7
Peat	5,500	8,000	—	—	3.2	2.6	—	—	4.8	—
Shale	1,200	2,000	—	—	.7	.7	—	—	6.6	—
Fuelwood and industrial waste	21,000	20,000	12,000	15,000	12.1	6.6	2.8	2.8	−.6	2.8
Hydroelectricity	4,200	12,700	15,240	19,000	2.4	4.2	3.5	3.5	14.8	2.8
Atomic energy	—	500	—	500	—	.2	—	.1	—	—
Total	173,200	302,600	430,260	559,500	100.0	100.0	100.0	100.0	6.4	3.3
Underground gasification (included in above)	22	430	—	—	—	—	—	—	—	—

the only practical use for underground gas consists of burning it under boilers in electric power stations located over the coal measures. At the Shatsk underground gasification station gas turbines have been installed to use the gas for generating electricity. The actual production of gas by underground gasification processes in 1957 and projected in the current seven-year plan is given in *Table 1*.

Fig. 4 shows a drilling team sinking a borehole to the lignite seam in the Angren underground gasification station. The gas produced in this station is fed through the pipeline shown in *Fig. 5* to the Angren State District Electric Power Plant.

The role of natural gas in the Soviet energy economy in 1957 and planned for 1965, compared with that of the United States in 1957 and projected for 1965, is shown in *Table 2*. The reports from which this table was derived do not clearly indicate whether the gas produced by underground gasification is included in the natural gas or the coal projections. The energy produced by underground gasification in 1957 would not show up as a significant percentage in either case, but in 1965 the planned production would be about 1 per cent of the natural gas production.

It is interesting to note that in 1965 the planned production of natural gas in the U.S.S.R. of 43,500 million therms, although it is a seven-fold increase over the 1957 production, nevertheless is about one-third of the 1957 U. S. production and about one-fourth of the 1965 projected U. S. production. The implied growth rates are 27 per cent for the U.S.S.R. and 5.8 for the United States. At these rates both countries would reach the same level of production in 1973, each with 285,000 million therms. However, the next seven-year plan calls for 95,000 million therms in 1972, which is one-third of the projected U. S. production for that year, but still more than double the 1965 planned production of natural gas in the U.S.S.R.

Where will the gas supply come from? There are now over 200 proven fields of natural gas in the Soviet Union. Among the fields that have been prospected in recent years and which have a particularly favorable outlook are those of Yakutia, Irkutsk area, the western plain of Siberia, Central Asia, the Far East, the trans-Caucasian provinces, and the Ukraine, Stavropol, and Lower Volga regions, and the fields in the Komi Autonomous Soviet Socialist Republic.

The seven-year plan provides for a total of 48 million ft of drilling, which is expected to increase the reserves by more than 100 trillion cu ft of gas in 1965.

Among the larger pipelines in service, or under construction, are the following:

Stavropol-Moscow, 2 lines, each of 28-in. diameter and 800 miles long.

Serpukhov-Leningrad, 28-in. diameter, 500 miles long.

Krasnodar-Serpukhov, 40-in. diameter, 800 miles long.

Thirty other pipelines ranging in diameter from 10 to 20 in. and in length from 100 to 500 miles are in service or under construction.

The heating season in Moscow extends from the middle of October to the middle of April. In 1958, the average daily summer load was about 300 MMcf; the corresponding winter load was 400 million, with a peak day of 670 million.

High-pressure storage is provided to take care of the peaks. Fixed volume spherical and both vertical and horizontal cylindrical holders are used. Gas is generally stored in these holders at about 100 psig, but the pressure is limited to 60 in the larger diameter cylindrical holders.

A liquid-methane liquefaction and storage plant has been in operation at Leninodacha, a suburb of Moscow, since 1954. This plant, said to have been designed by the Gas Machinery Co. in the United States, has a liquefaction capacity of 320 Mcf of gas per hour. A cascade liquefaction cycle is employed, using ammonia, ethylene, and natural gas as refrigerants in successive stages.

The liquid is stored in four vertical steel cylindrical tanks, each 9½ ft in diameter by 42 ft high, encased in a cylindrical tank 32 ft in diameter and 52 ft high. The space between the cylindrical tanks and the exterior tank is filled with block insulation called "mipora." An atmosphere of dry natural gas under a slight positive pressure is maintained in the insulation space to prevent absorption of moisture by the mipora insulation.

The valve system permits each interior cylinder to be filled with liquid methane or emptied individ-

LEFT: Fig. 4. Sinking a borehole at Angren underground gasification station.

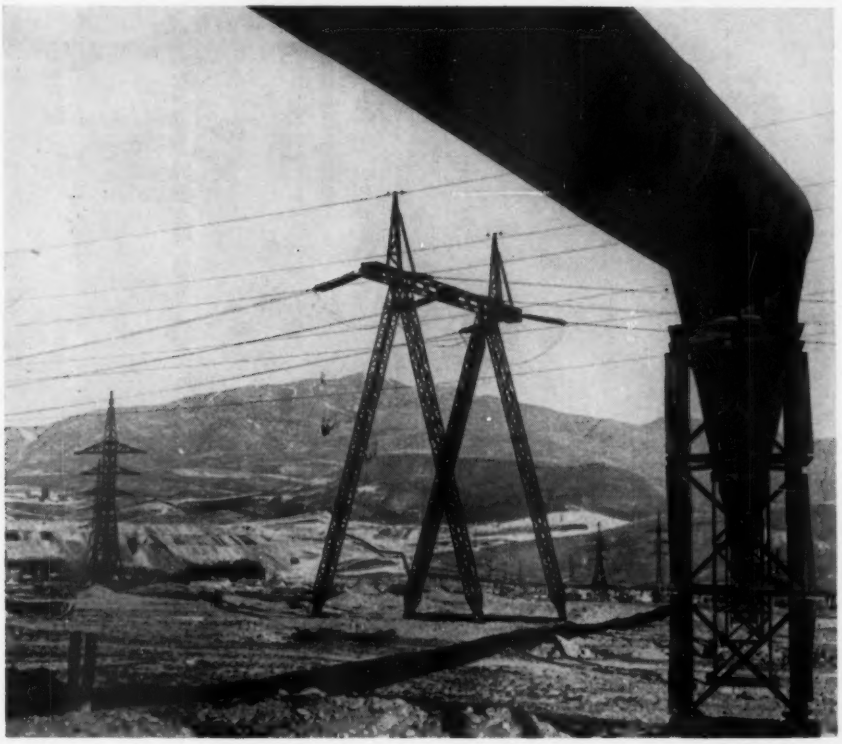


Fig. 5. Pipeline for transporting gas from the Angren underground gasification station to the Angren State District Power Plant.

ually. The liquid is stored at a pressure ranging from 9 to 12 psig. Based on 90 per cent filling of the tanks, the storage capacity is 7.25 MMcf.

The evaporation rate has been 2½ per cent per day, in contrast to the anticipated loss of one-tenth of 1 per cent per day; improved insulation material and methods are therefore needed. Except for the added operation required by the excessive evaporation, the performance of the plant, which is fully automatic, is excellent.

Liquid-methane distribution is provided to consumers who are too remote to be served by the regular distribution system of the Moscow region. Specially designed tank trucks with a capacity of one ton of liquid methane are used. Technical and economic feasibility is claimed for this type of service up to a distance of 60 miles.

Gas manufacture from coal and oil is conventional. Oil shale is gasified in modified gas producers and in continuous vertical retorts in which the distillation products are largely cracked and fixed to permanent gases.

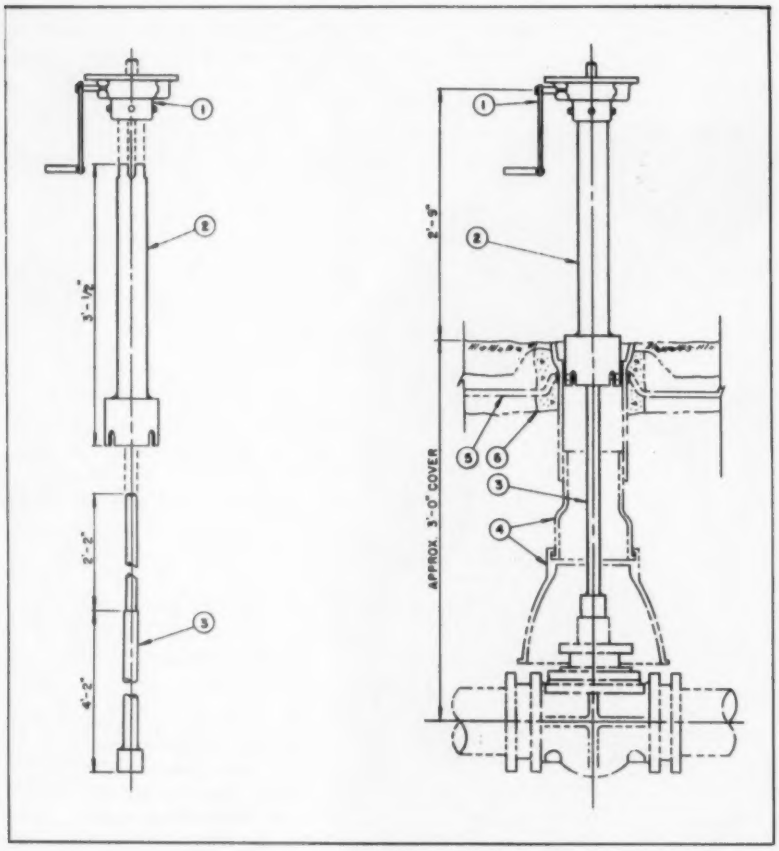
To sum up, the role of manufactured gas is rapidly diminishing in the Soviet Union, and natural gas is assuming the dominant position.

If it is reasonable to assume that the resources and the technical competence in both the U.S.S.R. and the U.S.A. will be adequate, then the growth will be determined by the relative positions of the gas industry in the total energy economies of both countries. These, in 1957, were 3.6 per cent in the U.S.S.R. and 26.9 per cent in the U.S.A. There is more new market area in the U.S.S.R. than in the U.S.A. Most of the large cities in the U.S.A. are already supplied with natural gas, and future growth will be in line with the growth of the gross national product.

In the Soviet Union the drive to expand the gas industry is based on two other important factors: (1) the high cost of mining coal, and (2) the burden imposed on the railroads by the long distances from the coal basins to the major energy-consuming centers. In terms of energy, Soviet natural gas production costs are about one-seventh of the coal production costs, and the corresponding transportation burden is entirely eliminated by the pipelines.

Many scientific and technical problems are under investigation. Included among them are improvements in methods of extracting, treating, transporting, and storing the gas. Geologic research is concerned at one end with the reliability of prospecting methods and at the other with formations suitable for underground storage of gas in the vicinity of the larger cities.

The presidium of the Academy of Sciences of the U.S.S.R. is giving top priority to the research and development needs of the gas industry. The Soviet government is frankly trying to bring the role of natural gas in its energy economy up to the U. S. level. This is quite a tribute to the American gas industry. ■



Master valve operator (6- and 8-in. plug valves)

KEY
1—Gear box
2—Operating stem housing
3—Operating stem
4—Valve box
5—Four ¾-in. outriggers
6—Concrete encasement

Portable gear operator for buried plug valves

GAS exclusive

By W. C. PETERS
Gas Design Engineer
Northern States Power Co.,
Minneapolis

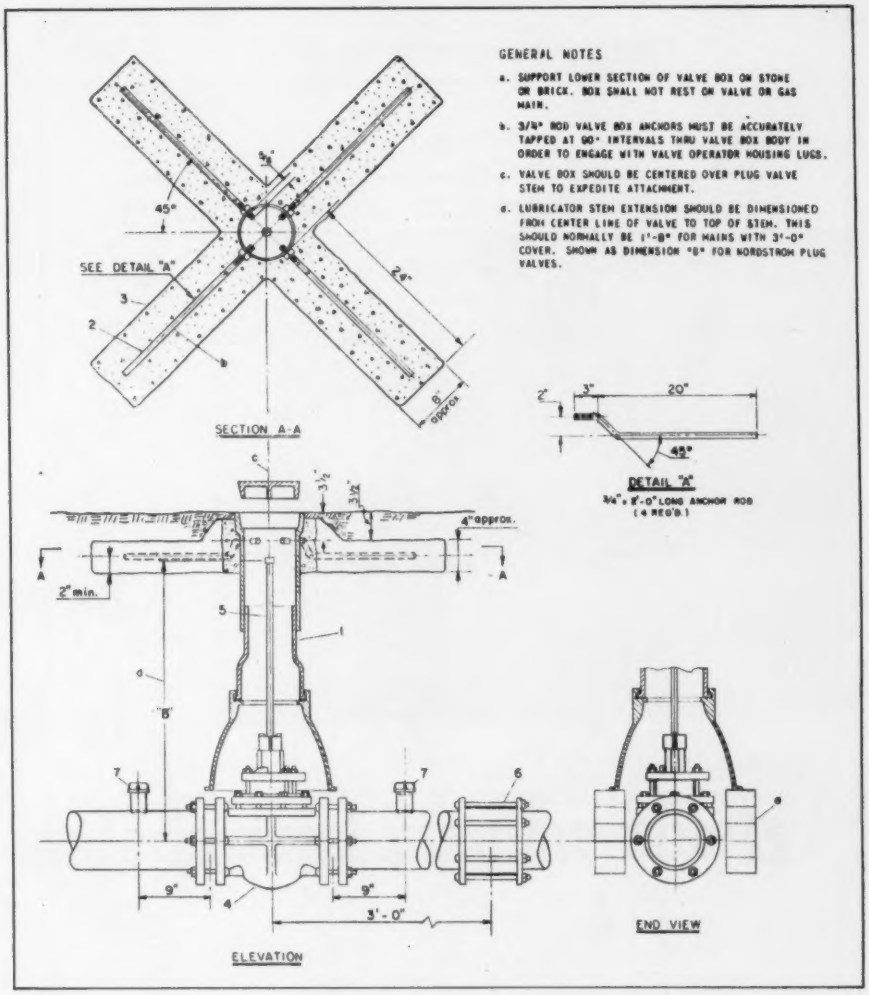
GAS utilities seeking a simple, economical method for one-man operation of buried plug valves too large for manual wrench operation, may find some interest in a new portable tool that has been developed.

Current methods for operating such valves in use in the industry cover a range from oversize "T" handle wrenches to elaborate vaults for housing geared valves and factory made gear housings designed for direct burial. Each has its advantages and disadvantages from the standpoint of installation cost, simplicity, dependability and maintenance.

Usually the size of valves where mechanical torque amplification is considered necessary to operate them, varies between those larger than the 4-in. and 6-in. sizes. Emergency and pressure control departments are well aware that unless a valve can be operated quickly at a critical time, preferably by one man, the valve may be of little more value than no valve at all.

Various approaches were considered in the search for a practical and economical hand-powered torque amplifier to operate plug valves. A basic specification on the list of requirements was that it would have to provide some 2000 ft-lb of torque and yet not be cumbersome or complicated. If the standard wrench-operated valve could be utilized, that offered the greatest economy since a 6-in., 175 psig, WOG valve

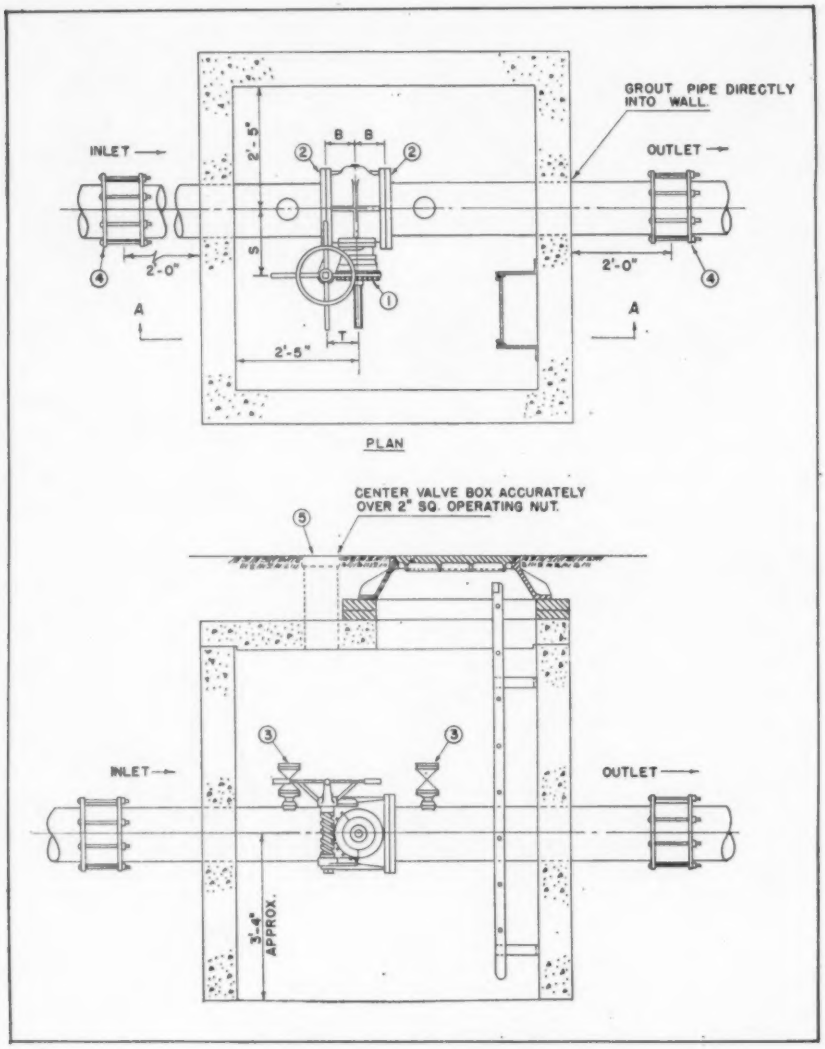
Valve and valve box installation for use with valve operator.


GENERAL NOTES
a. SUPPORT LOWER SECTION OF VALVE BOX ON STONE OR BRICK. BOX SHALL NOT REST ON VALVE OR GAS MAIN.
b. 3/4" ROD VALVE BOX ANCHORS MUST BE ACCURATELY TAPPED AT 90° INTERVALS THRU VALVE BOX BODY IN ORDER TO ENGAGE WITH VALVE OPERATOR HOUSING LUGS.
c. VALVE BOX SHOULD BE CENTERED OVER PLUG VALVE STEM TO EXPEDITE ATTACHMENT.
d. LUBRICATOR STEM EXTENSION SHOULD BE DIMENSIONED FROM CENTER LINE OF VALVE TO TOP OF STEM. THIS SHOULD NORMALLY BE 1'-8" FOR MAINS WITH 3'-0" COVER. SHOWN AS DIMENSION "B" FOR NORDSTROM PLUG VALVES.
45°
SEE DETAIL "A"
SECTION A-A
DETAIL "A"
3/4" ø 8'-0" LONG ANCHOR ROD (4 REQ'D.)
4" approx.
2" min.
ELEVATION
END VIEW
3'-0"

Operating stem placed on valve. Housing and gear box at right

Operating stem housing placed over operating stem.

Gear box in place for operating plug valve.



Vault-type valve installations. In 6- and 8-in. sizes, these are eliminated by use of geared valve operator.

KEY
1—Lubricated plug valve
2—Slip-on, welding flanges
3—Weldolet
4—Dresser coupling
5—Valve box

can be purchased for less than half the price of a similar geared valve.

As a result, a portable geared valve operator was designed which consists of three parts, all of which are light in weight. The assembly consists of a valve operating stem, an operating stem housing, and a gear box with a 60-to-1 reduction ratio.

Valves used for this type of operation are the regular wrench-operated valves that are installed the same as for "T" wrench operation with one modification. In order to absorb the counter thrust of the gear box, four 0.75-in. x 2.00-in. outrigger rods are threaded through the top of the valve box. They are placed in the form of an "X" over the main and are encased in concrete. The inside ends protrude about 0.5 in. through the valve box to act as retaining lugs for the operating stem housing.

The operating stem consists of a 2-in. square socket on the end of a seamless steel pipe terminating with a square drive shaft at the upper end. The hollow lower section permits use on plug valves equipped with lubricating stems.

The operating stem housing has a collar with four slots which engage the outrigger lugs inside the valve box. The top end of the housing has four slots which provide a bayonet connection with the gear box.

The gear box consists of an aluminum housing which contains the reduction gears. This assembly is constructed of high tensile strength materials in order to keep down its weight. A square socket within the 180-deg. worm wheel has a sliding fit over the square drive shaft with sufficient clearance to permit operation in the event of misalignment of the valve box over the valve. The crank is turned in the direction the valve is to be operated. The stops built into the plug valve function the same as if the gear mechanism was located directly on the valves.

Installation of 6-in. and 8-in. plug valves are now being made for the described method of operation in the various gas properties of the company. Actual experience in operation should show up any refinements or modifications that might be desirable as well as whether the valve operator should be adopted for the larger plug valve installations. ■

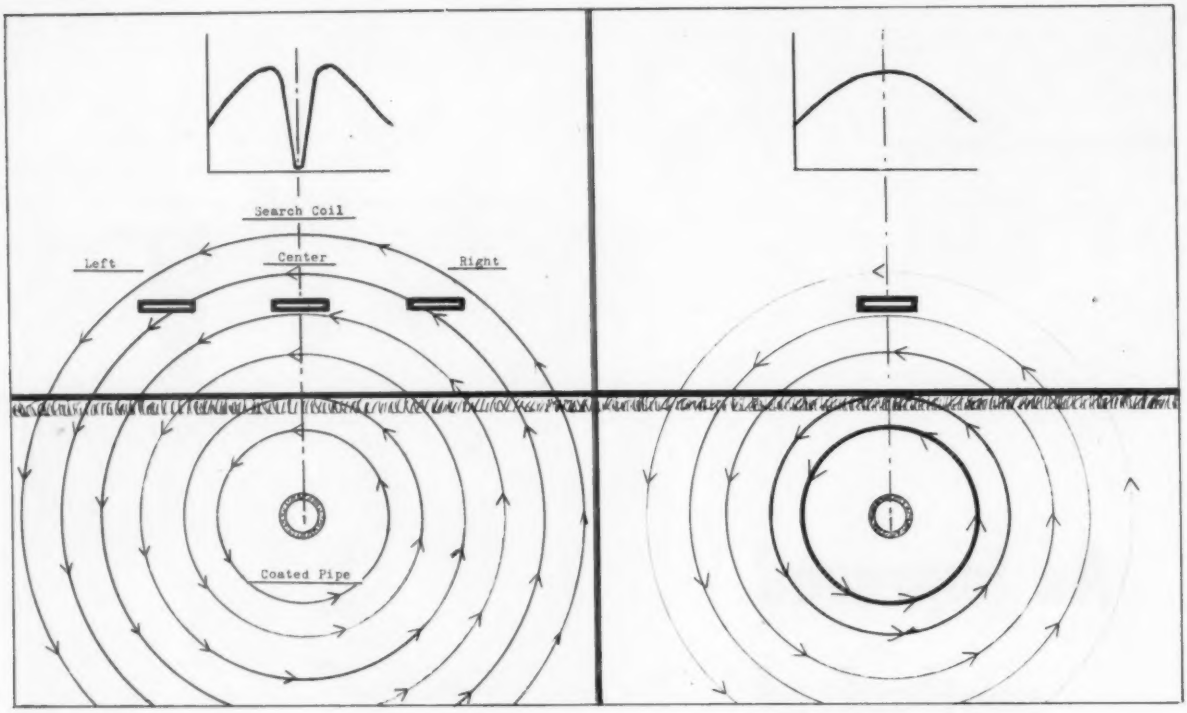
Operator moves down street holding null signal.

An improved method of locating underground pipeline shorts

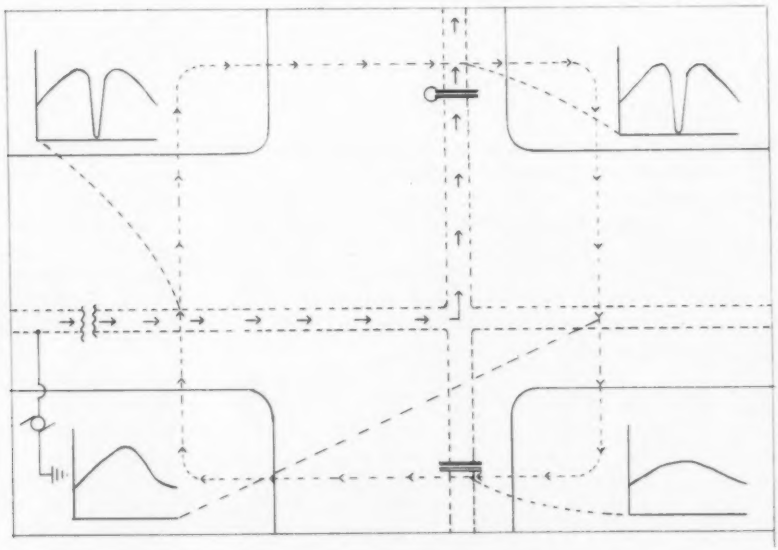
THROUGH the use of a newly developed search technique and apparatus, representatives of the Tinker and Rasor Co. were able to locate and isolate a short in an underground pipeline which had previously defied detection for more than a year. The short, located in a gas line in a municipal system in a large southern California city, had been searched for at frequent intervals from the time the line was first put under protection more than a year ago.

Previously the search had been conducted by the usual technique in locating major discontinuities on coated pipelines. That is, an audio frequency signal is applied between the coated pipe and a good earth ground. A traverse over the line away from the audio oscillator is made by walking over the pipe with an inductance in the form of a coil, a suitable audio receiver and ear phones. Audio current flowing through the coated pipe will cause an electrical field around the pipe. By placing the inductance coil in a vertical position with reference to the pipeline, a strong signal is received over the coated line. As the departure is made away from the oscillator, the audio signal will gradually diminish, the amount depending on condition of the coating and the amount of audio energy that is fed into the coated line. When traverse is made away from the audio oscillator, and a rapid drop in audio signal is denoted, a discontinuity is assumed to lie under this point. This method requires that a rather broad difference in audio signal level has to be observed. Further differences in audio level can occur from interference from other piping in close proximity to the coated member, all of which contribute to inaccuracies in locating the electrical short.

The new technique looks for the disturbance of a null and therefore gives a sharp indication of the location of the short. The basis of this improved technique is the fact that when audio current flows in a conductor (such as pipe) a field is created around the pipe and at right angles to it. When the field is intercepted by an inductor, current will flow in it. If the inductor is held in the same plane as the pipe and moved over it, the induced field is cancelled when the inductor is immediately over the pipe. Of course, this happens only when relatively high current flows in the pipe. Therefore, if the pipe is in contact with another structure which is grounded (such as a water pipe) current will leave the coated pipe and enter the water pipe. The same cancelling effect then takes place in the water pipe. Beyond this point of null or cancellation there is no high current flow.

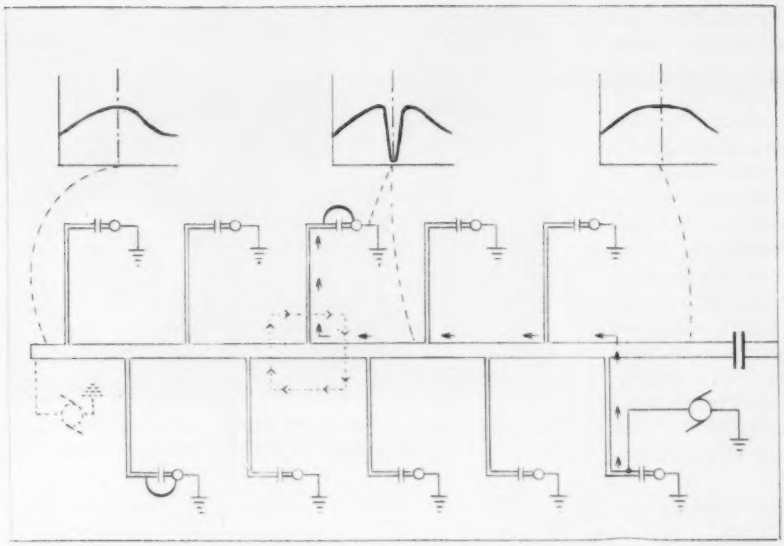


ABOVE: Audible signal difference between audio signal on pipe from inductance (A) and conductance (B). BELOW: Installation where cathodic protection is desired in one section only. Note where insulator failure allows current flow to other system.

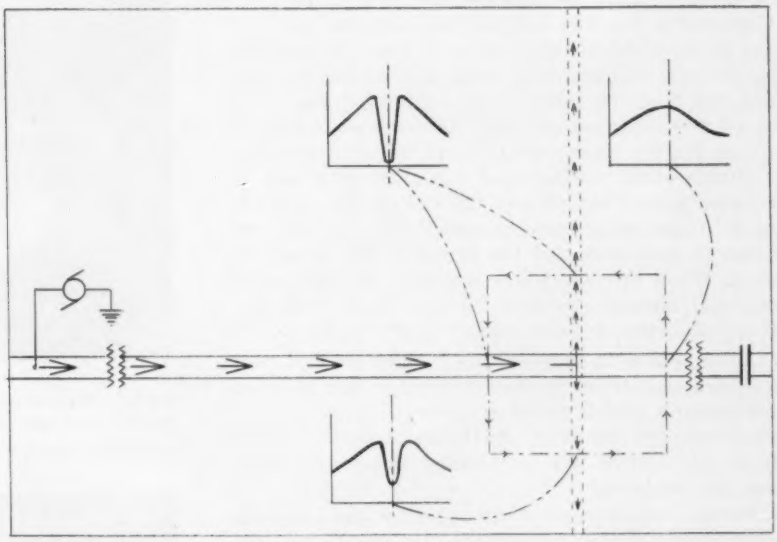


The principal benefit of this null method is the fact that the cancellation or null effect occurs only when current is flowing and the location is therefore pinpointed in inches rather than in feet, since the null disappears or drops very sharply at the site of the short. Briefly, the recognized search system looks for sharp differences in the audio signal and therefore depends upon varying factors such as acuteness of hearing, outside interference, etc. However, the null method looks for disturbance of the null itself, which is a positive factor. Either the null exists or it does not exist.

Early this year, a representative of Tinker and Rasor met with officials of the city which owned the



ABOVE: Typical meter installation in residential area. Note insulators shorted and current flow through shorted insulator to ground. BELOW: Typical short form foreign line. Note current flowing off main at point of electrical contact. Difference in audio signal on main between inducted current and beyond electrical contact clearly indicates point of contact.



gas line mentioned above and began a search for the short. It was known by the current requirements that the system contained shorts and it was suspected they were not able to protect the line with the available anodes.

The line under question was a primary line under a paved street in a residential area. Service lines left it at frequent intervals to houses on the street and there were water lines and water service lines in the same general vicinity. The Tinker and Rasor man, beginning at one end of the system, followed the line down at a rapid walk for about five blocks, holding a constant null as he moved. As he entered an intersection five blocks from the start, the null was lost.

A square traverse was made around the intersection. The probable short was pinpointed at a location where an insulating flange was known to be isolating the system from another system not protected by

cathodic protection. Using test leads available at the surface, a measurement was made across this flange with a millivolt meter. The difference in potential indicated the flange was insulating, although audio current was flowing past this point. This flange was dug up and a short was found in one of four coupling bolts holding the flange together. The short was caused by steel washers making a dead short through one of the bolts. The other three bolts were properly insulated.

As soon as the defect was removed from the flange, the pipe-to-soil potential immediately rose to one which showed adequate protection. The entire search exclusive of the time spent in opening the flange, consumed about one-half hour. Previous searches had been made many times without locating the short. Briefly, this method of determining is looking for the presence or absence of a positive characteristic rather than the quality or strength of an always existing characteristic.

In order to make this method effective, an audio current of from 5 to 10 watts must be available.

The effectiveness of the null system was further documented in tests conducted in Waxahachie, Texas. In these tests, a number of searches were run on gas distribution lines operated by the gas distribution company of the area.

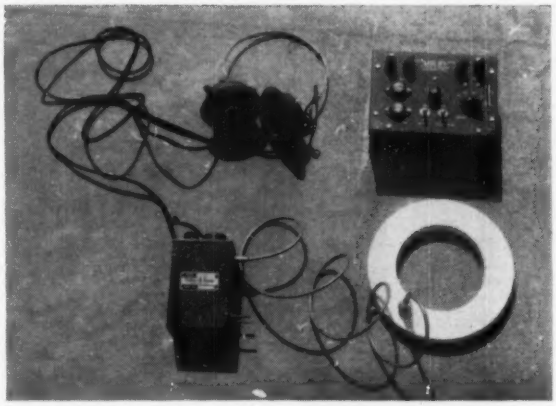
The first search was made on a 4-in. gas distribution line which ran down a narrow alley blanketed with overhead high tension lines which could normally be expected to create interference in the search. However, nominal interference was noted. A short was suspected in this line and searches had been made off and on for a considerable period of time. In fact, suspected spots had been dug twice without success after searches made by conventional equipment and methods. A 10-minute search using the newly perfected null system found a short one-half block from the oscillator. A double check coming back the other way took 10 minutes more. The spot was dug and an old abandoned, 2-in. gas main crossing under the new line was found to have contacted the new line and caused the short. When this short was removed, the pipe-to-soil potential jumped nearly a full volt, indicating adequate protection was now being placed on the line.

A 6-in. gas main some five blocks from the first main was then checked by the null method. In this instance, a 15-minute search found a service line at a meter which was not insulated. Additionally, one-half block from this service line, a coupling was found which was not insulating.

Further experiences in Albuquerque gave absolute confirmation of the null method. This search was conducted over six miles of gas mains, all of reasonably new construction. The entire 6-mile search took place at about 10 miles an hour from a vehicle. Two places were found where valves supposedly insulated actually were not. Of course, these caused dead shorts across the valves.

Boiled down to fundamentals, it was concluded that it is much easier to look for a lot of nothing than a little of something.

It is expected that use of the null search method will both simplify searches and aid in the removal of shorts which have escaped previous detection. ■



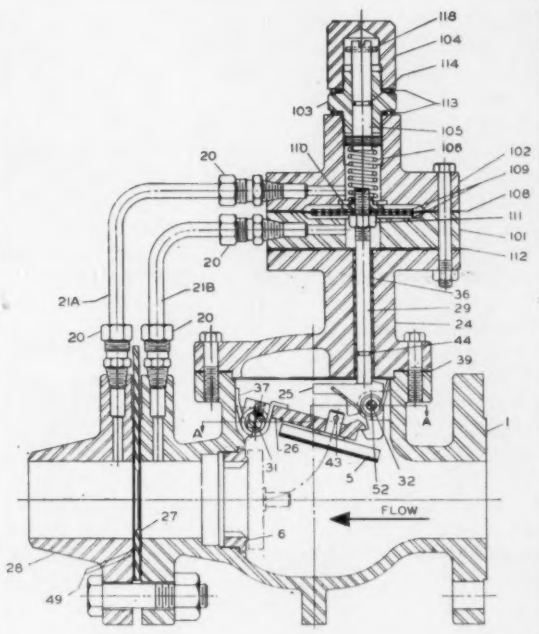
Equipment used to run survey consists of transistorized oscillator, and receiver, earphones and low impedence search coil.

ABOVE: Measurement is made across flange with millivolt meter. BELOW: Bolt with steel washer is removed. Here, ground-to-soil potential rose sharply.

Valve sentries guard river crossings

■ ■ *One-year guard-duty hitch at frequently flooded crossing completed*

FLOODS—and their transmission-line-breaking potential—are an occasional problem for many gas utilities. On its 70-odd miles of transmission lines, 145,000-customer Mississippi Valley Gas Co. (Jackson, Miss.) has had one such particularly pesky problem, a pipeline river crossing near Columbus in east central Mississippi. Source of the floods is the Tombigee river, which roughly parallels the northern third of the Alabama border, then crosses into Alabama. The Tombigee is subject to flash floods at any time of the year, especially in the vicinity of Columbus, where it is about 175 ft wide.

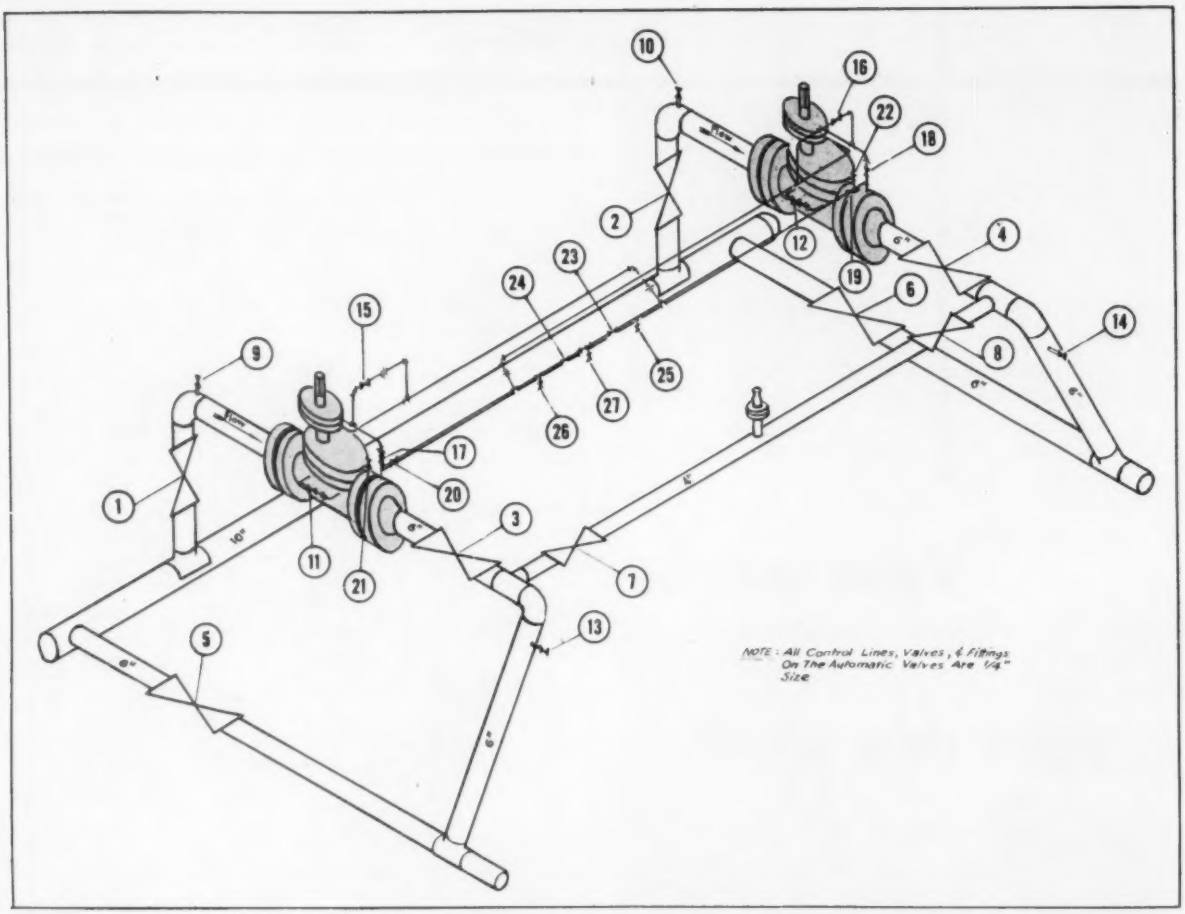


COPPUS SENTRY VALVE

MODEL 1200

	1	VALVE BODY
	5	VALVE DISC
	6	VALVE SEAT
	13	GASKET
	20	MALE CONNECTOR
	21A	TUBING
	21B	TUBING
	24	VALVE COVER
	25	LATCH LEVER
	26	DISC ARM
	27	ORIFICE PLATE
	28	ORIFICE FLANGE
	29	PLUNGER PIN
	31	RESET SHAFT
	32	LATCH LEVER SHAFT
	33	BULL PLUG
	36	COVER BUSHING
*	37	DISC ARM SPRING
	38	'O' RING
	39	GASKET
	40	GASKET
	43	COTTER PIN
	44	'O' RING
	49	GASKET
*	52	LATCH SPRING
	54	STEM HOUSING
	55	CAP
	56	THRUST WASHER
	101	DIAPHRAGM CONTROL H'S'G. (BOTTOM)
	102	DIAPHRAGM CONTROL H'S'G. (TOP)
	103	STEM HOUSING
	104	CAP
	105	ADJUSTING STEM
	106	CONTROL SPRING
	108	DIAPHRAGM
	109	CONTROL DISC
	110	UPPER CLAMP NUT
	111	LOWER CLAMP NUT
	112	GASKET
	113	GASKET
	114	'O' RING
	118	STOP PIN

* NOTE-NOT USED ON SIZES 6"&8"



AUTOMATIC SHUT-OFF VALVE INSTALLATION

Columbus Input Line, Tombigbee River

Valves are numbered on the above control piping sketch so that the odd numbered valves are related to the operation of the automatic valve in the south run, and the even numbered valves are related to the operation of the automatic valve in the north run, with the exception of valve number 27 which is common to both.

Description of valves in installation:

No. 1 thru 6 ..... 6" gate valves
No. 7 and 8 ..... 4" gate valves
No. 9 and 10 ..... ½" globe valves
No. 11 and 12 ..... ¾" plug valves
No. 13 thru 27 ..... ¼" globe valves

Procedure for placing automatic valves in service:

1. Assure that valves 5, 6, 15 and 16 are open.
2. Close all other valves.
3. Open valves 11 and 12 to bypass around the automatic valve discs.
4. Open valves 3 and 4 to apply line pressure on the automatic valves.
5. Open valve 17 to apply line pressure to both sides of the diaphragm in the south run.
6. Open valve 18 to apply line pressure to both sides of the diaphragm in the north run.
7. Reset both automatic valves to the open position using the special wrenches provided.
8. Close valves 11 and 12.

NOTE: During subsequent operation of valves, operate slowly to prevent surges, and check valve discs in automatic valves after each operation to assure that they are still open.

9. Open valves 1 and 2.
10. Close valves 5 and 6 to establish flow through automatic valves.
11. Open valves 19 and 20.
12. Close valves 15 and 16.

Procedure for taking automatic valves out of service:

1. Open valves 15 and 16.
2. Close valves 19 and 20.
3. Open valves 5 and 6.
4. Close valves 1 and 2.
5. Close valves 3 and 4.
6. Close valves 17 and 18.
7. Open valves 9 and 10 to relieve pressure on automatic valves.
8. Open valves 25 and 26 to relieve pressure on both sides of diaphragms.

CAUTION

In no case should the 6" valves downstream of the automatic valves or in the valve pit on the east bank of the river be closed until the automatic valves have been taken out of service and the pressure on the diaphragms relieved.

When taking the automatic valves out of service always open the ¼-in. bypass valves 15 and 16 before operating any other valve.

GUARD DUTY

Mississippi Valley Gas has an underwater crossing at Columbus, dual 6-in. pipelines which supply the town's 17,000 inhabitants. They are part of a short line which begins at a Southern Natural Gas Co. meter station, and runs 2.7 miles to the town border station, crossing the river 0.55 miles upstream from the town station. It was originally installed in 1929 and operates at between 135 and 160 psi with volume somewhat over 500 Mcfh.

When the Tombigee overflows, it spreads as much as 300 ft from its banks. One of these floods, in 1958, broke one of the 6-in. lines in the middle of the river. Examination showed that the other line was in poor condition and both were replaced. Although the new crossings were installed under the river bottom, Chief Engineer F. J. Guice and C. A. Clark of the utility's engineering department decided to take additional precautions.

At first, pneumatically controlled valves—standard on transmission lines such as this—were considered. Such valves require a constant bleed of instrument air or natural gas, so their operation would be impaired by inundation. The alternatives seemed to be either to move the valves so far from the river that their effectiveness would be impaired—or to take expensive precautions to waterproof the system.

A supplier's sales engineer began figuring the cost of the waterproofed, pneumatically controlled installation, but complications and high costs caused him to look for another solution.

Coppus Engineering Corp.'s Model 1200 Sentry excess flow valve seemed particularly well suited because it is a completely self-contained unit that does not need electricity or instrument air to function. Its control signals come directly from the line in which it is installed, since it operates by measuring the gas flow passing through it.

Shown in an accompanying cross section drawing, the valve has an orifice with openings immediately upstream and downstream. Tubing leads from these openings to a diaphragm control housing. The spring-loaded diaphragm is attached to a latch that holds the valve open. Thus, the rate of flow through the orifice determines the pressure differential acting on the diaphragm. If the rate of flow increases to the point where the pressure differential becomes greater than the diaphragm's preset spring loading, the pin holding the latch moves, instantly releasing the valve disc to close the valve. After actuation, the valve remains closed until manually reset.

This valve was designed to allow two installation variations. First, in place of an orifice, any other restriction in the line can be used to provide a differential pressure in the diaphragm control housing. Second, the valve may be closed without an excess flow condition by manually or automatically opening a bleed line and releasing pressure above the diaphragm—provided the line pressure does not exceed 300 psi.

Last October, a pair of these valves was installed approximately 500 ft from the river. The complete layout is shown in the accompanying diagram. The 6-in. Sentry valves were installed in separate 6-in. lines isolated by an equalizing line. On the opposite side of the river, the lines come together and are separated only by a check valve, which closes to prevent a reverse flow in the event of a line break.

Here's how Mississippi Valley's C. A. Clark describes the operation of the system:

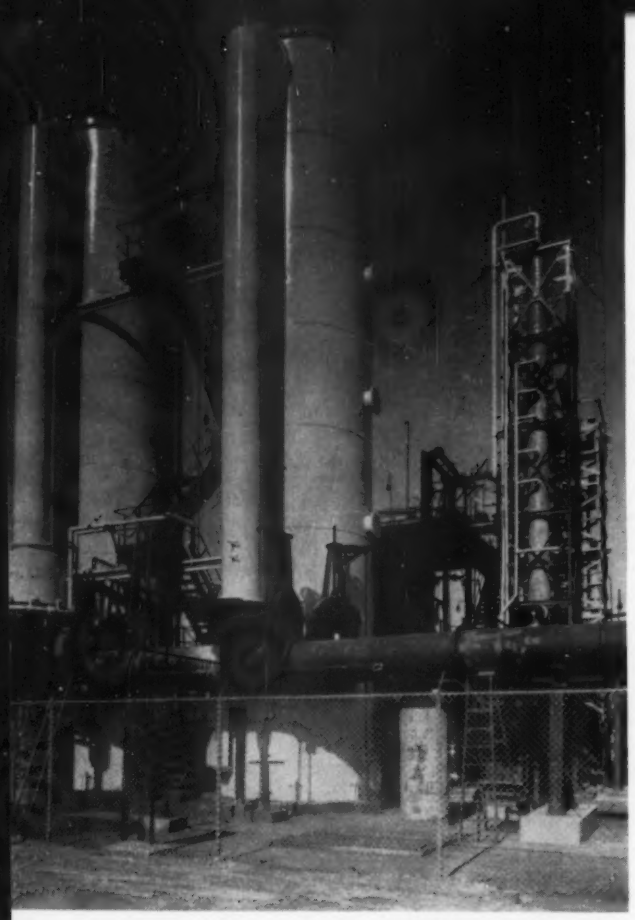
"The differential diaphragm on each of these Sentry valves is feeling a difference in mainline differential, not the differential produced by the orifice in its respective line. There is no difference in differential pressure between the two lines when the gas flow is normal. Should a break occur somewhere in the river, this would immediately set up a greater differential in one line and in the diaphragm chamber of its Sentry valve. When this differential approaches 78 in. wc, the valve would close. When this occurs—with the control piping arranged as it is—the pressure underneath the Sentry valve diaphragm in the opposite line is bled down. This means that, regardless of what differential developed in the line remaining in service, its Sentry valve would not trip."

The procedures for placing the Sentry valves in service and taking them out of service accompany the installation diagram. Clark prepared these with the assistance of Coppus representative H. R. Gilbert of John H. Carter Co. Inc., Metairie, La.

"Before these valves were placed in service," said Gilbert, "we checked the differential on each as much as 15 times with a high pressure differential meter to prove the calibration of the sensing element. The valves tripped within 1 or 2 in. wc from their setting, which was extremely helpful. We then checked the differential across each orifice plate in its respective line to determine whether the calculations regarding the size of the orifice plate were in order. This also proved satisfactory. With the test meter, we then checked the differential between the two lines when gas flow was normal. There was approximately zero differential, which also was very desirable. The valves were then placed in service. We were able to duplicate an actual line failure by isolating individual lines and releasing gas to the atmosphere. The valves performed 100 per cent satisfactorily."

These mechanical sentries on the west bank of the erratic Tombigee have thus far completed a one-year hitch without the challenge that would send them into action. Thus, they have not yet had the chance to prove themselves, as was recently indicated by Mississippi Valley's Chief Engineer F. J. Guice:

"It is difficult to say how efficient this type of installation will be until it has actually performed its design function. This, of course, would involve a line break, so we hope that the installation will never have to prove itself. (But), all indications are that it will perform as designed." ■



Exceptionally high gloss of these scrubbing towers contrasts markedly with dull surface of yet-to-be-coated large diameter pipe below. Note color coding on distillation tower at right.

Brooklyn Union

Color codes with urethane coatings

WHILE color coding gas industry equipment is frequently highly desirable, it may just as frequently be highly impractical because of pigment-destroying conditions. But now urethane coatings promise long life and a high degree of color retention. Brooklyn (N.Y.) Union Gas Co. has just completed a one-year test of urethane coatings on the light oil recovery plant at its Greenpoint Works.

Instead of the traditional black and gray finish, two 60-ft scrubbing towers, three distillation towers, connecting piping, supports, and fences were transformed into a veritable rainbow. Mark Harrison, superintendent's assistant at the works, worked out an eight-color system. Apple green, blue green, and yellow were used for the towers and supply piping. Other colors are sky blue, royal blue, pale gray, orange, and maroon.

A total of 60,000 sq ft of surface was to be covered, all of it subject to two highly corrosive factors, salt water atmosphere and vapors from nearby metal industries. In addition, the two largest surfaces, the scrubbing towers, are frequently subjected to spillage of paint-attacking scrubbing oils.

A possible solution seemed to be urethane coating, which solidifies through a chemical reaction. The coating consists of two separately packaged components, isocyanate and resin, which react to produce a hard, glossy finish. Produced by Mobay Chemical Co., Inc., the components may be mixed as long as eight hours before application and are said to be completely nontoxic and to produce no irritating vapors. The supplier, Better Finishes and Coatings Inc., has provided a wide range of colors by mixing pigment into the resin.

Before specifying urethane coatings, Brooklyn Union subjected them to two tests.

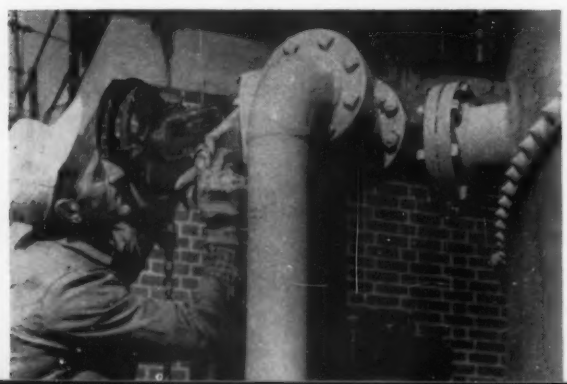
"To test chemical resistance," said Harrison, "we submerged a urethane coated rod in crude light oil. After two weeks, the coating was completely unaffected. Then we painted the outside of a steam turbine with urethane, and after three weeks, could detect no loss of color—even though turbine temperatures ranged from 280 to 380 deg. Because of this exceptional toughness and corrosion resistance, we expect almost double the longevity from this coating."

While urethane coatings cost more than paint, the overall savings should be many times that extra cost. Labor cost for this job ($9000) is about 75 per cent of the total cost; and if the urethane coating lasts twice as long, it should halve labor costs.

The project involved four steps. First, the old, flaking paint and rust were removed. Second, urethane red primer was applied. Third and fourth, two coats of finish-color urethane finished the job.

Because urethane coatings normally dry to the touch in about four hours, they are subject to little damage from airborne grit and other contaminants. In some areas on this job, the first coat could be applied as soon as two hours after the primer. Such fast drying facilitated crew maneuvering and reduced total job costs. ■

Use of several colors and the windy location of much of the work necessitated brush application for the entire job.



GAS DISTRIBUTION NEWS

Tarnished '60 should improve

The fourth quarter of the slightly "tarnished" golden year of 1960 should witness a slightly improved economy, a group of gas and electric utilities' marketing executives were told recently.

Dr. Marcus Nadler, economist and professor of finance at New York University, was guest speaker at the opening session of the three-day, 24th annual Ebasco Services client companies' marketing conference.

Dr. Nadler said that the slightly improved fourth quarter should burgeon into an even better 12 months in 1961. The American economy is "in the midst of a rolling readjustment" and that "barring unforeseen events" overall business conditions will display greater improvement.

"There will be no boom," he said. "Nonetheless, it will be a well-defined upswing in all business areas. . . . "

At the same meeting, the marketing executives were told that the utility industry can "stagnate" if it does not concentrate on "forward planning" in marketing. Speaking was Stanley F. Damkroger, assistant vice president of the American Telephone & Telegraph Co.

He urged utilities "to create demand, not just supply it." He told the executive group to expand their sales horizons, adding that "marketing complacency" was the greatest single detriment to a healthy organization.

Real growth must come from new concepts, new ideas, and new products, Damkroger insisted. "A company that relies for growth on population and personal income increases will soon lag far behind the field."

Pushes gas heat for schools

"Gas is best for school heating," says Northern Natural Gas Co. in a new informational pamphlet.

Recently published, the pamphlet is being sent to all school boards in the company's 20-county northern Illinois service territory.

"Revolutionary Engineering Achievement"

"A revolutionary engineering achievement" and "a new scientific principle for cooking with gas" are among the ways Whirlpool Corp. has described its new Blanket-O-Flame cook-top unit. Unveiled at the AGA Festival of Flame in mid-October, this new range features an enclosed fan to supply secondary air.

The result of three years of research costing more than $1 million, the Blanket-O-Flame is said to provide new highs in cooking efficiency, cleaning convenience, and design and operation simplicity.

A dramatic demonstration of the unit's ability is the controllability provided by its Magic Flame thermostat, said to be able to maintain a constant temperature low enough to cook an egg on a paper plate without burning the plate!

The enclosed fan "automatically provides an ideal amount of secondary air, metered for each particular cooking heat." This secondary air is dispensed in a horizontal plane above the primary air and gas mixture, providing an air-cushioned flame which spreads the heat evenly over any shape of cooking surface and permits cooking vessels to be located closer to the flame.

Since an opening below the burner is unneeded, a one-piece pan (shown in the photo) can be used to greatly ease cleaning. Specially designed grates provide minimum heat retention. Among the other features are tilt-top control knobs that lie flush when not in use.

Suggested retail price, as well as marketing and advertising plans, have not yet been established. The unit will be test marketed in four or five areas during the remaining months of this year.

Sears' first gas refrigerator

The first gas refrigerator ever to be marketed by Sears, Roebuck & Co. made its debut at a mid-October press review.

A refrigerator-freezer combination, the new Coldspot is expected to do much to repopularize the gas refrigerator.

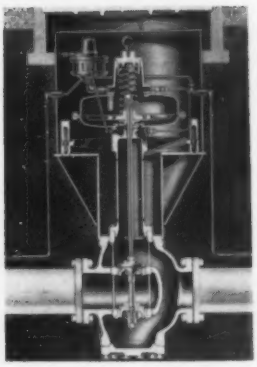
Maytag produces gas washer-dryer

Production of its gas model washer-dryer combination began in early October, according to a Maytag Co. announcement. The new model, to be in distribution channels before the end of the month, is a revision of the electric combination introduced in 1959.

GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 81, 82

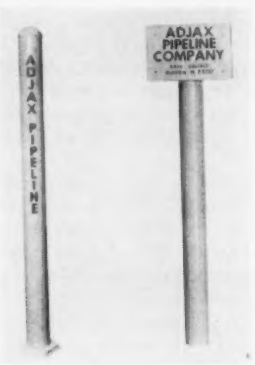


1. Pit regulator design

Type 297 is an economical regulator concept for pit installations (GEC-700). It is constructed with Fisher Type 298T gas regulator, which is enclosed in a cylindrical steel housing. The buried unit is reinforced to protect against the heaving effects of frozen earth.
Fisher Governor Co.

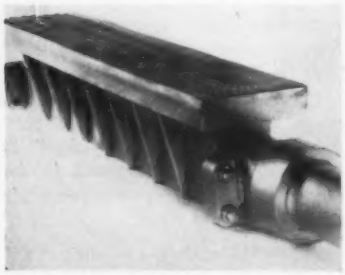
3. Linked computers

Two widely separated computers can now exchange information directly over the phone while each continues to print out results of calculations (GEC-180). IBM's 1009 data transmission unit links magnetic core memories of solid-state 1401 computers over telephone and telegraph lines.
International Business Machines



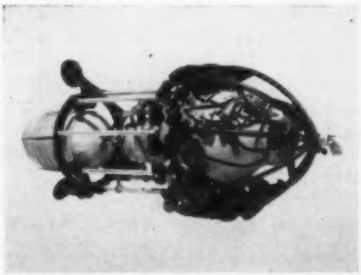
5. Marker posts

Handley Industries has developed a new line of non-metallic pipeline marker posts and signs (GEC-500). Made of a resin-rubber compound, they are rust- and rot-proof. The posts may be equipped with side- or top-mounted signs and with cathodic terminal cap, vent cap, and telephone tab.
Handley Industries



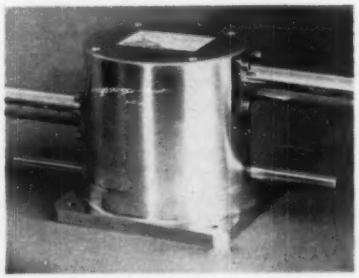
2. Infra-red burner

A new gas-fired infra-red burner features controlled wave-length radiant emission for high-efficiency heat transfer (GEC-400). It is designed for low-temperature industrial processing. Face temperature of the 4 x 18-in. burner screen is 1200 to 1800 deg F.
Bryant Industrial Products



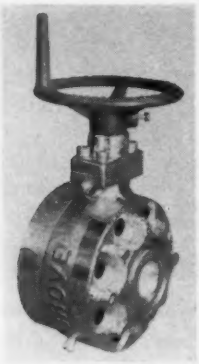
4. Line-up clamp

Faster, easier line-ups are offered in a new internal line-up clamp (GEC-650). Double rollers eliminate friction between clamp and pipe. Distorted or out-of-round pipe is brought into perfect circle and any diameter differences are distributed uniformly.
Crose-Perrault Equipment



6. Gas regulator

Del Monte's precision gas regulator controls pressure at any selected remote point in a pumping system (GEC-700). It is self-correcting for effects of static pressure on the valving, and is further compensated for dynamic forces induced by gas flow.
Del Monte Technical Associates

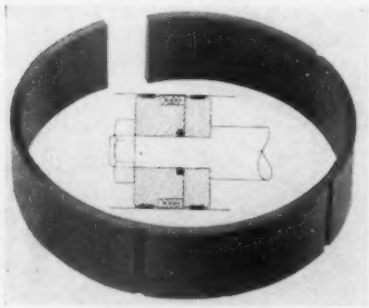


7. Regular-port valve

Grove's G-6 regular port valve is for general pipeline and production service (GEC-820). It can be used in Christmas tree assemblies or as a wing valve, casing head valve, or tubing head valve. It is ideally suited for use in flowlines, headers or manifolds where large full-opening valves are not essential.
Grove Valve & Regulator Co.

8. Relief Valve

Fisher's new piston-operated high-pressure relief valve is ideal for town border stations (GEC-820). It can accurately relieve large capacities of gas under severe pressure and flow conditions. Type 404 gives bubble-tight shutoff at all pressure drops through its specially designed composition disc.
Fisher Governor Co.



9. Piston wear rings

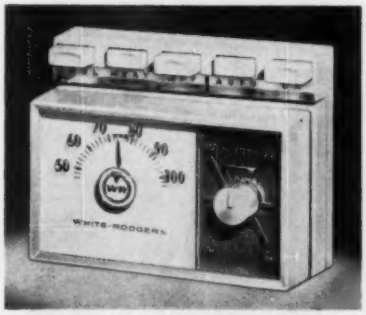
Filled nylon is being used to fabricate piston-wear rings for use in heavy hydraulic cylinder applications for off-the-road equipment (GEC-210). Garlock makes the wear rings in a wide range of standard sizes. The material is said to have excellent wear resistance, requires no lubrication, and is used for bearings in many applications.
Garlock Inc.

10. Automatic control

Clark's new multi-unit, automatic control panel serves as a single control point operating up to five electric motor-driven compressors (GEC-160). It is designed to keep in operation only those units required for immediate demands. The panel permits manual or fully automatic operation of any one or all compressors.
Clark Bros. Co.

11. Frost chisel

Arrow is producing a new cutting tool specially designed to work in deep frost (GEC-010). The chisel, attached to the Arrow mobile hydraulic hammer, can be dropped repeatedly with a force of as much as 9000 ft-lb to penetrate the deepest frost. It makes possible economical work in frozen ground.
Arrow Manufacturing Co.



12. Pushbutton thermostat

The third model in White-Rodgers "Straight-Line Look" series of thermostats has been introduced (GEC-190). Eight different switching combinations are available in the PushButton, satisfying the requirements of all heating-cooling systems encountered. Also featured are sealed mercury contacts, adjustable heating and fixed cooling anticipation.
White-Rodgers Co.

all Brass
GAS STOPS
for...

METER SETTINGS
Flat Head • With or Less Check
Lock Wing

SERVICE LINES
Low, Medium and High Pressure

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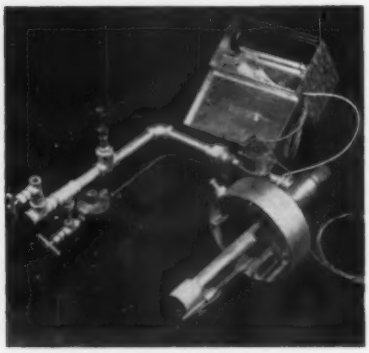
Three-Way • Graduated Dial

APPLIANCES
AND EQUIPMENT
Lever Handle • Square Head
Flat Head
A.G.A. Listed Control Valves

GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.

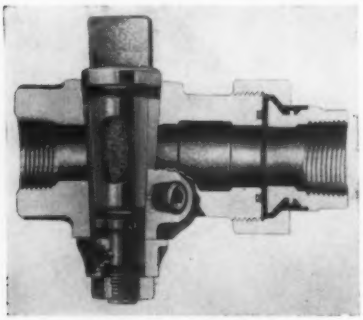


13. Pilot-relighter

UGC designed this instrument to safely relight pilots on pipeline heaters and eliminate danger of freeze-ups due to heater outage (GEC-200). If the pilot goes out, the instrument cuts off the main supply to the burner, waits three minutes to clear fire box of gas, and then relights the pilot and turns on gas to burner.
UGC Instruments

14. Expansion joints

Dutch-made vibration-free rubber expansion joints for pipelines are said to eliminate fatigue failure (GEC-370). Expansion or shrinkage of pipelines due to fluctuating temperatures is absorbed by the joints. Available in low- and high-pressure units, the joints can be used in existing as well as new pipelines.
Netherlands Trade Commission

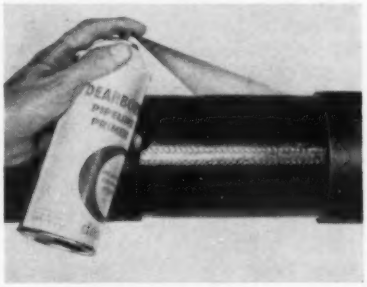


15. Insulating union

A new insulating union outlet is available on Mueller LubOSeal and tamper-proof gas meter stops (GEC-370). The outlet will not leak under even the most adverse service conditions. By combining its gas meter stops with the new insulating union, Mueller provides a practical, easy-to-install method of effectively isolating service lines from house piping.
Mueller Co.

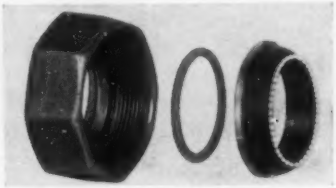
16. Service truck

The newly designed Series 25-G Powers-American service and maintenance body is for gas service work (GEC-790). The Series 25 body is so planned that with a slight rearrangement or removal of shelves and bins, it can be made to meet the most exacting requirements of any utility. Done on the assembly line, this literally gives a custom-made body at a mass-produced price.
McCabe-Powers Body Co.



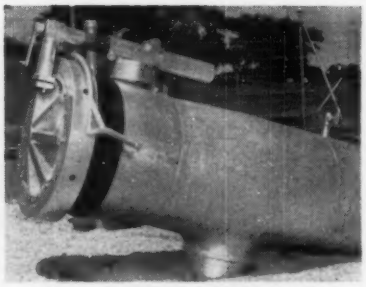
17. Pipeline primer

Dearborn's pipeline primer is now available in aerosol package (GEC-610). The primer is released smoothly and evenly. Freon pressurizing eliminates waste or spillage. The dispenser carries the seal approval of the New York Fire Department. Available in 15-oz cans in case lots of 12.
Dearborn Chemical Co.



18. Self-locking joint

A specially designed Normac self-locking joint for couplings and fittings fulfills a need on the compression end when there is danger of pull-out (GEC-370). Any outward pull of the pipe tends to roll a stainless steel spiral ring into a declining recess with increasing grip on the pipe.
Norton-McMurray Mfg. Co.

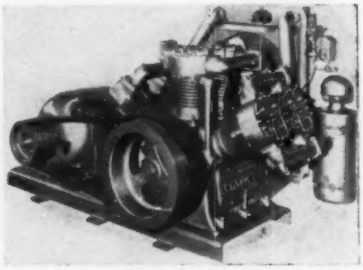


19. Quick-opening closure

Moorlane's closure is for scraper traps, gas scrubbers, pressure vessels, and pipeline strainers (GEC-370). It provides a quick-opening fitting with closure head having a beveled seat and O-ring gasket. It comes in 12- through 18-in. pipe sizes for vertical or horizontal installation.
Moorlane Co.

20. Hot-applied tape

Tapecoat 20 is a new, improved coal tar protective coating in tape form (GEC-130). The product is hot-applied with the use of a torch. Tapecoat 20, designed for single-thickness application following standard priming practices, is said to provide both coating and wrapping benefits.
Tapecoat Co.



21. Air compressors

A new line of 100-lb air compressors in the 25- to 100-hp range has been introduced by Clark Bros. (GEC-160). The compact, two-stage C-Line features complete air cooling, thus eliminating the need for cooling water duty as well as the extra weight and expense of water jacketing.
Clark Bros. Co.

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22. Manhole pumps

Layton Co. describes its new Model DA-4 pneumatic diaphragm pump for cleaning out wells, tanks, excavations, manholes, etc., in a four-page catalog (GEC-660). The pump is powered by compressed air for effective, efficient operation.
Layton Co.

23. Flow Meters

Honeywell describes its new Whirl-Flo meter which uses vortex-velocity principle for measuring liquids and gases (GEC-560). Catalog C-295-1 says the simply designed, ruggedly built meter measures volume rate at line conditions.
Minneapolis-Honeywell

24. Refrigerated storage

An 8-page bulletin from Chicago Bridge & Iron tells how to combine economy with efficiency in the storage of liquefied petroleum gases (GEC-740). Various types of refrigerated storage are discussed and illustrated.
Chicago Bridge & Iron Co.

25. Dewpoint indicator

Weighing & Controls has published Bulletin DPI-4 on its portable dewpoint indicator (GEC-540). Easy to use, the indicator gives accurate readings over a range of dewpoint temperatures from ambient to —100 deg. F.
Weighing & Controls Inc.

26. Compact range

Caloric's "Compacto 30" gas range is described in a four-page folder (GEC-240). The Compacto 30 combines burner units and oven in a floor-supported counter unit. Also discussed is Caloric's kitchen-color planning service.
Caloric Appliance Corp.

27. Scientific gas venting

A new, comprehensive catalog of products for scientific gas venting has been issued by William Wallace Co. (GEC-840). The 12-page guide to Metalbestos products has information on and specifications of Type B vents.
William Wallace Co.

28. Ultrasonic pipe testing

A 9-page bulletin describes the operation of the 3-D ultrasonic testing system for pipe (GEC-760). Driam equipment tests the weld area in three dimensions. Four sonic heads beam waves in a manner that results in recorded echoes from defects that lie in any plane. The printing recorder indicates precise area of defect—on the right, left, or center of the weld seam. An audible signal also is triggered by the echo from the defect.
Driam Corp.

29. Chart integrator

American's chart integrator for interpretation of strip charts and conventional round charts is described in Bulletin 419 (GEC-750). The bulletin tells how the integrator converts from use with strip charts to use with conventional round charts by means of a simple adaptor plate.
American Meter Co.

30. Hinged closures

New design features and extended size ranges for its line of one-man hinged closures are described in revised Bulletin TT956 from Tube Turns (GEC-370). Applications are outlined for blanking off pipeline ends and tank or vessel openings.
Tube Turns

31. Compressor meter

Technical installation and use data on the Servis oil meter for use on pipeline compressors is available in a new folder (GEC-170). Applicable charts and data show flow rate vs. head, flow rate vs. viscosity, and flow rate vs. temperature for the meter.
Service Recorder Co.

32. Regulator accessories

Reliance Regulator vent caps, flanged venturi reducers, and companion flanges are described in two bulletins (GEC-700). Bulletin 172 covers five vent caps. Bulletin 173 covers 24 sizes of venturi reducers and 40 sizes of companion flanges.
American Meter Co.

33. Gas line probe

Impacto Tools has a catalog describing its new Super "30" reparable gas line probe (GEC-465). Featuring one-man operation, the probe has 30-in. penetration.
Impacto Tools

34. Single-shaft gas turbine

Clark's recently introduced 9000-hp single shaft gas turbine is the subject of Bulletin 198 (GEC-815). Primary design considerations of simplicity, low first cost, easy access to all areas, and high reliability are discussed, along with a detailed description of major components.
Clark Bros. Co.

35. Loader

J. I. Case's new 9000-lb capacity W-12 loader is detailed in a new 16-page catalog (GEC-210). "Fact Finder" index permits quick reference to outstanding features.
J. I. Case Co.

36. Back-up ring

Parbak, Parker Seal's continuous and contoured back-up rings, are covered in a 12-page booklet (GEC-390). Design, dimension, and other data are presented.
Parker Seal Co.

37. Pneumatic computing

Sorteberg force bridge, a pneumatic computing relay, is covered in an 8-page bulletin (GEC-750). Fischer & Porter Catalog 53CR-1000 gives detailed application data for each of the computer's operations, including multiplication, division, squaring, square root extraction, square root extraction with pressure compensation, simultaneous multiplication and division, etc.
Fischer & Porter

38. Gas turbine economics

The economics of gas turbine power generation are discussed in Bulletin 202 from Clark Bros. (GEC-815). A comparative analysis is made of gas turbine, steam, and diesel generating plants. Pointed up are the unusual economic advantages of the gas turbine plant.
Clark Bros. Co.

39. Pressure instruments

A complete line of pressure instruments made by Bailey Meter is described and illustrated in a new 2-page bulletin (GEC-540). Measuring mechanisms, indicators, recorders, and transmitting devices are included in Bulletin 40.
Bailey Meter Co.

what we're after in the end, of course," one coal association official says privately. This statement is not one which the industry has been making publicly in its fuels policy drive.

Also involved in the new cooperative coal approach are more stringent controls over imports of residual fuel oil.

For the immediate future, a straight-out natural gas bill drive is again in the works. Even if the possibilities of getting a simple gas bill through Congress are as bad as they appear—with or without an anti-industrial sales provision—this drive is still vital. Constant pressure for a natural gas bill will be the major catalyst to include the principles the industry seeks in revisions of the laws which create and give powers to the independent agencies, such as the Natural Gas Act in the case of the Federal Power Commission.

Both coal and gas interests are ready for the 1961-62 gas bill fight. Coal industry officials, including unions, mines, rails, and major users, have met to ready the strategy they will use, and the amendments on which they will insist when the fight opens next year.

Gas industry officials—producers, pipelines, distributors—met in New York early in October to start trying to put together a consolidated industry gas bill. They hope that the usual intra-industry fights can be conducted in private, and an agreed-to proposal hashed out in the inner sanctums of the industry meeting room.

Success for such a bill, and probably even for inclusion of the theories into a regulatory agency revamping, rests on cooperation within the gas industry, and even on some truce between the gas industry and its business competitors, the coal, oil, and electric industries.

Rep. Harris has made it clear that he won't push a gas bill until inter-industry feuding is cleared up, and the same approach would undoubtedly hold for anyone else who might take over the job of mentoring the fuels industries in Congress whether for gas legislation or in reorganizing the regulatory agencies.

Coal spokesmen believe they are a shoo-in next year to win their fight for a special congressional committee to begin a study of the national fuels policy question. This is only a first step. But should it occur, it would be a major tactical defeat for the gas industry in any of its drives.

Any resolution of the gas industry's problems would be under extreme pressure to await the end of this study and the recommendations of the special committee. There is little doubt that the coal industry has more strength than the gas industry can generate for some years.

THE 27½ per cent gas and oil depletion rate isn't out of trouble in

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FASTER
INSTALLATION
LONGER LIFE
IN METER
GREATER METER
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Every quality part in this improved Lancaster Complete Main Movement Assembly with new hex is designed to make it easier to install for proper centering and easier adjustment for correct balanced stroke. Saves time . . . assures real accuracy . . . keeps meters in service longer. Upper and Lower Main Movements, Valve Cranks are available separately—or order entire Assembly ready to install.
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spite of the campaign-inspired easing of Democratic opposition.

Democratic election problems in Vice Presidential Candidate Lyndon Johnson's home state of Texas were obviously responsible for the shift in the party's position on depletion. Its long-time demands for reduction in the rate, at least for larger producers, was clearly implied in the party's platform drafted just before Kennedy and Johnson were nominated.

Candidate Kennedy in the past has supported moves to cut the rate to large producers. Johnson, as a Texan, has diplomatically stayed on the sidelines of this fight. Nixon is continuing his support.

Kennedy changed his tune in late September, saying that the "oil depletion allowance has served us well by this test (providing a high rate of exploration and production)." He presumably also intended to include gas.

He said in response to a question from Scripps-Howard Newspaper Alliance, that:

"The depletion allowance, which affects over 100 items, should be considered primarily as a matter of resources policy and only secondarily as a tax issue. Its purpose and its value are first of all to provide a rate of exploration, development and production adequate to our national security and the requirements of our economy. This is true not only with regard to oil, but with regard to natural resources generally."

But there were hints that this position on the part of the candidate was ready to be shifted to conform to the traditional opposition of his party to depletion. The rest of his statement stresses the need for further "study" of the issue. He continued:

"Any reassessment of depletion policy, whether it involves maintaining, increasing, or lowering any of the present percentage allowances on raw materials, should wait on and be decided on the basis of our resource requirements as determined by this materials policy study. As President, I would initiate such a study as a first order of national business."

The threat is throughout that this new "policy" could easily be

no more knuckle-busting . . .

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has Large, Easy-to-Operate

Top Screw Handle right up on top

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Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

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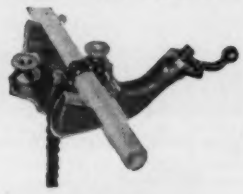
5 Sizes for ⅛" to 8" Pipe, Conduit or Rod



RIDGID

The Ridge Tool Company, Elyria, Ohio, U.S.A.

shifted after his study to become an all-out attack on the rate as applied to gas. Oil, it is indicated, might be permitted to retain the present rate.

He contended that:

"At the present time, with exploration and development declining, it is essential that there be a careful review of this entire problem to insure that the policy regarding depletion is adequate to safeguard our future energy needs. Such a review must be based on the categorical proposition that a healthy domestic oil industry is essential to national security.

"For this reason, I believe we must have a new and comprehensive study of U. S. materials requirements and policies for the decade ahead, as called for in the Democratic platform. The last such study, the Paley Commission report of 1950, is long out of date and it is vitally important that we conduct a new inventory for the new conditions of the 1960's and the critical problems we face in this decade."

This points up what may well be some sharp conflicts for the Democrats in the future between Kennedy and his running mate, as well as Rep. Sam Rayburn, Texas, powerful head of the House Democrats.

Rep. Rayburn told a Texas oil audience recently that "the Texas congressional delegation has for all these years protected them with the 27½ per cent depletion allowance, which I believe necessary to keep up the search for oil. If we didn't have it, we wouldn't have any independent oil operators, either."

Candidate Nixon, replying to the same Scripps-Howard question, repeated his support for the gas and oil depletion rate. He said:

"I firmly support the oil and gas depletion allowance as an effective and proved method of stimulating the production of resources which are essential to our economy.

"In some quarters it is more popular politically to favor the reduction, or even the elimination, of this allowance. But to take such a position is to overlook the purpose of the original legislation.

"It helps to guarantee a strong, healthy domestic industry which would be able to supply our needs in the event of national emergency, or if a situation should develop in which we were to be cut off from our normal foreign sources of oil.

"We cannot run the risk of taking steps what would deplete, rather than replenish, our domestic oil reserves and production. For that reason, I consistently supported the depletion allowance when I was in Congress, and I support it today."

SALES of appliances will run at about the same level for the next 12 months as they have in the past year if consumers follow present buying plans. A new survey by the U. S. Census Bureau for the Fed-

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You've made a worthwhile investment in this pipe. You've spent some more on cleaning and coating. Why risk the cost of digging it up in a few years to repair corrosion damage?

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CABLE: ELECTRO, NEWARK, N. J.

Washington • *Continued*

eral Reserve Board shows consumer buying intentions are holding level with a year ago. This lends weight to the predictions—in dispute by many—that there will be no further slippage in the economy. Consumer confidence holds the key to the business upturn.

* * *

Firms with overseas operations will get from $20 to $40 million a year in new tax deductions. Under a new law passed in the bobtailed session of Congress, firms may now add total taxes paid foreign governments and take the total percentage against the 52 per cent U. S. rate. Previously, they could get the credit only country-by-country, which meant a tax payment above 52 per cent was not totally deductible nor could any excess be applied against a payment of less than the U. S. rate.

* * *

Home building is showing some recovery from its earlier doldrums. Housing starts in August rose 8 per cent over the bottom hit in July. While still below last year's near-record, a "good" Fall is in prospect.

corrosion • *Continued*

from page 19

locally to as low as 0.6 volt. This may take place in a section only 20 ft long, so that even a survey at 100-ft intervals will fail to locate it.

But this will not occur unless both conditions named above are present—extensive damage to the coating and high resistivity soil. If a similar area of extensive damage lies in low resistivity soil, where loss of protection would be of great importance, the increased current demand will be so great that the effect on the line's potential will be widespread, and thus not likely to escape attention. Nevertheless, it is still possible for hundreds of feet of line to be lacking in protection, and yet for the potential profile, as determined from a limited number of test points, to indicate complete protection over miles of pipeline. ■

P18

for bigger profits in small line work—

DIG IN FAST WITH A 77 TRENCHLINER®

Small main and service line work steps ahead quickly when you dig in with the Parsons® 77. It's not much wider than a yardstick, yet can cut 6″ to 18″ trench down to 5-ft. depths at speeds up to 21 lineal feet per minute.

The 77 has 32 hi-lo digging selections — a speed for most profitable penetration in any ground. It's easy to use, move, and maintain. See your nearby Parsons distributor for details or write for bulletin.

Close quarter work no problem here! 77 can move within a track's width of side obstructions — speed your trenching in closest quarters. Removable seat.

PARSONS COMPANY
NEWTON, IOWA

A Division of KOEHRING Company

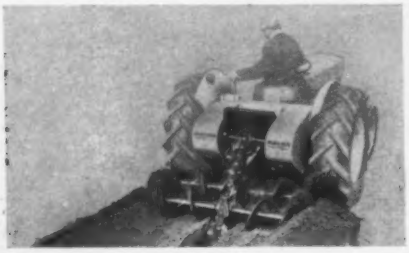
WHY IS
AUBURN
THE
QUALITY TRENCHER?

Where it's manufactured?

Auburn Machine Works, Inc., established 1928, long known as the "House of Trenchers" is justly proud of its modern, precision equipped manufacturing facilities. Equipment that assures "Quality Controlled" production.

How it's manufactured?

AUBURN'S skilled craftsmen have a pride of workmanship that comes with years of experience, training, and study in the manufacturing of trenching equipment. Their expertness in the operation of precision machine tools and their thorough mastery of the measuring and testing devices used throughout each stage of production, is your guarantee of the quality of the AUBURN.



Job proven... Simple in design the Auburn Trencher is a perfect example of quality and ruggedness. It digs up to 800 ft. per hour—trenches 6" to 14" wide and down to 6 ft. deep.

Auburn owners, all over the world, have proven that quality means dependable performance and the most economical operation on all types of jobs.

AUBURN MACHINE WORKS, INC.
2055 South J Street, Auburn, Nebraska, U. S. A.

Please send complete information and name of nearest dealer.

*Name*_____

*Address*_____

*City*_____ *State*_____

GAS·PEOPLE

Grove Lawrence
Pacific

H. L. Bosshard
Pacific

T. A. Johnson Jr.
Pacific

D. P. Faulhaber
Grayson

G. E. Doty
Grove

B. J. Hancock
Grove

E. C. Bird
Grove

GROVE LAWRENCE, 35-year veteran in the natural gas business, has been elected president of Pacific Natural Gas Exploration Co., newly formed exploration and development subsidiary of Pacific Lighting Corp. Other new officers are: STUART T. PEELER, vice president and secretary, and HARRY L. BOSSHARD, treasurer and assistant secretary. Lawrence and Bosshard were elected directors, along with JOSEPH D. PEELER. Field manager for the newly formed company is THOMAS A. JOHNSON JR., formerly gas reserves engineer with Pacific Lighting Gas Supply Co. Bosshard previously was staff assistant in the treasury and tax department of Southern California Gas Co. Both Peelers are attorneys with the Los Angeles law firm of Musick, Peeler & Garrett. Lawrence joined SoCal in 1925 as an engineer. He rose to the post of vice president before he transferred to Pacific Lighting Gas Supply as vice president in 1958. He will continue to hold that post.

DONALD P. FAULHABER has been named eastern sales representative of Grayson Controls division. Faulhaber, formerly with Robertshaw-Fulton's International division, will headquarter at Haddonfield, N. J.

Several major changes have been made in Grove Valve & Regulator Co.'s sales organization. GEORGE E. DOTY, formerly vice president-sales, is now vice president and general sales manager. He will direct all sales activities from the Oakland, Calif., headquarters. B. J. HANCOCK succeeds Doty as vice president-sales, and is responsible for all field sales. He headquarters in Houston. E. C. BIRD is now district sales manager in Houston.

D. E. Gaiennie
Holan

A. C. Frank
Holan

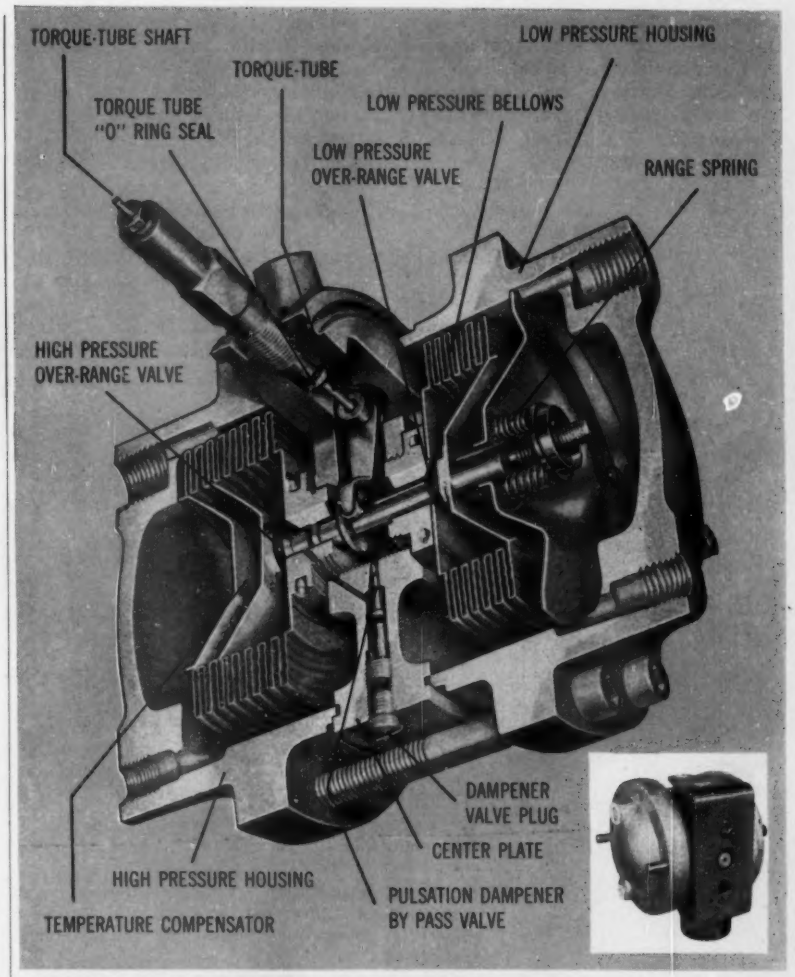
ARTHUR C. FRANK has been promoted to district manager and DARYL E. GAIENNIE has been appointed assistant sales manager of the Holan Corp., Cleveland, Ohio. Frank's territory includes eastern Ohio, western New York, and a large section of Pennsylvania. Gaiennie has joined Holan after 20 years in the utility field.

CHARLES R. ATTWOOD has joined the sales staff of Arkla Air Conditioning Corp. He will represent Arkla in the Chicago and surrounding areas.

JOSEPH F. MCCAHON has succeeded JOHN J. NATALE as manager of Philadelphia (Pa.) Electric Co.'s customers' accounts division. Natale has retired. E. HOWELL EVANS replaces McCahon as assistant manager.

HUGH T. LIBBY, former manager of gas engineering and development for B. C. Electric at Vancouver, B. C., is now assistant to the general manager of the company's gas division. In other changes, N. H. ALLEN, gas distribution engineer, moves to Victoria and R. K. KIDD becomes administrative engineer.

HARVEY H. PLANK has retired as chairman of the board of directors of Delaware Power & Light Co., Wilmington. FRANK P. HYER succeeds Plank as chairman of the board and AUSTIN T. GARDNER succeeds Hyer as president. Gardner has been vice president and secretary. HAROLD W. CLIFT, vice presiin charge of gas and electric operations, has been assigned the additional responsibilities of heading the company's construction program.



DON'T WORRY ABOUT OVERRANGING THIS METER BODY

The exclusive Barton rupture-proof dual bellows meter is not affected by overranging, maintains calibration and requires minimum maintenance.

Built-in ability to withstand violent line surges, yet immediate response to the slightest differential pressure or level changes – that's the Barton rupture-proof 199 meter body. Proved in countless demanding installations, the 199 meter body is the heart of an entire line of precise instruments that includes controllers, indicators, recorders, integrators, transmitters and switches. The 199 meter body features such refinements as temperature compensation for maximum stability, adjustable pulsation dampener for positive response control, top and bottom pressure taps for self-draining and easy venting. The 199 is available in a full range of differential pressures up to 50 psi and static pressure ratings up to 6,000 psi. For the ultimate in dependability, accuracy and minimum maintenance, specify Barton.

BARTON®
INSTRUMENT CORPORATION
580 MONTEREY PASS ROAD, MONTEREY PARK, CALIFORNIA

HAL P. STEPHENSON has joined the sales staff of Vulcan Rubber Products division of Reeves Brothers. His territory includes Delaware, Maryland, Pennsylvania, Washington, D. C., West Virginia and parts of New York.

CARL T. ASHBY has joined Borg-Warner Corp. as director of engineering for Norge refrigerators and home freezers. The recently resigned president of Conrad Inc. was associated for 22 years with Servel Inc.

DONALD L. GARRISON has joined Kraloy Plastic Pipe Co., Santa Ana, Calif., as national manager of gas industry sales. Garrison started in the gas industry in 1950 when he joined the Boston (Mass.) Gas Co.

DILLARD CANTRELL is now assistant to the president of Trinity Steel Co., Dallas. . . . Acting director of the research division at Allis-Chalmers Manufacturing Co. is WILL MITCHELL JR., succeeding the late Dr. H. K. IHRIG.

C. R. Rikel
SoCal

R. Mittelstaedt
East Ohio

C. R. RIKEL has been named division manager for Southern California Gas Co.'s northeast division. He succeeds the late MYRON THOMAS. In his new post, Rikel heads operations in the Pasadena, South Pasadena, San Marino, Alhambra, San Gabriel, and Altadena areas.

ROBERT A. MITTELSTAEDT is superintendent of gas control for East Ohio Gas Co., Cleveland. Mittelstaedt succeeds WILLIAM J. GILBIN, who retired.

THEODORE M. CHUBB has joined H. Zinder & Associates as director of the Pacific Southwest division. Chubb is a former chief engineer and assistant secretary of Pacific Lighting Corp. He will headquarter in Zinder's newly opened permanent offices in Los Angeles.

JOHN P. ROCHE, president of the Heppenstall Co. of Pittsburgh, is a new director of the Columbia Gas System Inc., New York.

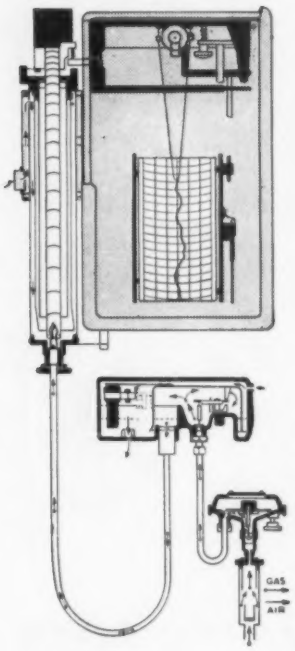
E. CARL SORBY, vice president of Geo. D. Roper Corp., has been elected to the board of trustees of the Institute of Appliance Manufacturers.

Deaths

DONALD F. FRASER, 47, vice president-manufacturing of Garlock Inc., Palmyra, N. Y.

MAHLON A. COMBS, 67, a consultant with the American Gas Association.

J. R. WOODFILL, 51, manager of industrial gas sales for Northern Indiana Public Service Co., Hammond, Ind. Mr. Woodfill began his utility career with the Public Service Co. of Colorado in 1931. In 1938 he joined NIPSCO as a cadet engineer. Woodfill was a former chairman of the Midwest Industrial Gas Council.



Sigma
Wobbe Index Recorder
THE WORLD'S FIRST

Now, Sigma's Wobbe Index Recorder gives you a continuous record of *actual* thermal delivery.

$$\text{Wobbe Index} = \frac{\text{Calorific Value}}{\sqrt{\text{Specific Gravity}}}$$

This instrument is reliable and relatively inexpensive. Recordings are highly accurate. An optional unit will also control Wobbe Index if desired.

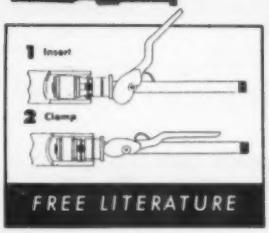
The Flow Regulator regulates gas flow to the burner. It senses slight changes in specific gravity and compensates for changes in barometric pressure and room temperature.

The Recording Mechanism is actuated by the heat of the combustion of the gas. Responds rapidly to changes in Wobbe Index. Not affected by normal temperature and pressure changes. Highly sensitive, frictionless magnifying system. All parts well protected against corrosion.

Write For Further Information

COSA — *National Representatives for Sigma Instrument Co., England*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N. Y.



ANDERSON TEST PLUGS

You can save 40 minutes per pipe section tested

With 6 years of utterly SAFE experience, Anderson Plugs save about 40 minutes (on 4" pipe) per pipe section tested by replacing cumbersome end welding and cutting. If each of your trucks makes only one test per week, the tool investment will be completely paid out within a year.

ANDERSON & GRUNSKY
P. O. Box 455, Santa Cruz, California

Manufacturers of time-saving Anderson Test Plugs and Pipe and Tubing Pullers

GAS ASSOCIATIONS

Instrument meeting slated

The 9th annual instrumentation conference of the School of Engineering, Louisiana Polytechnic Institute, is scheduled for Nov. 3-4 on the Ruston, La., campus.

Papers will cover such subjects as "Unique Problems in Process Control in Propellant Manufacturing Processes"; "The Relationship of Existing Primary Measurement to Complete Computer Control of a Processing Plant"; "High Speed Chromatography"; "Process Instrument Engineers' Notebook"; "Practical Considerations of Instrumenting a Petrochemical Plant"; and "New Trends in Flow Measurement."

In addition to the papers, there will be exhibits of new equipment in instrumentation and process control.

SGA course enrolls 500

Since it was launched last January, Southern Gas Association's home study course in natural gas distribution has enrolled over 500 students.

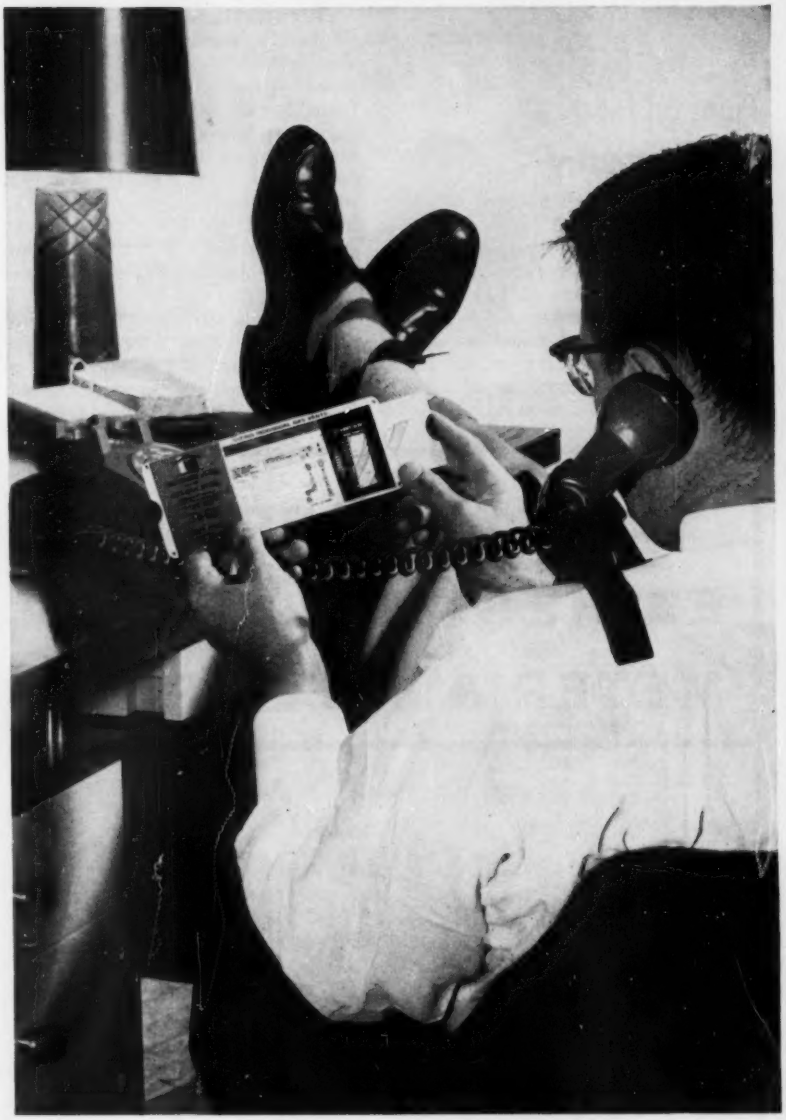
A joint effort of SGA and Texas A&I College, the course is designed to give a distribution employee a better understanding of his job, his company, and the natural gas industry. According to the association, applications for enrollment have run the gamut of gas company personnel.

Full information about the course is available from Prof. E. H. Miller, Distribution Home Study Course, Texas A&I College, Kingsville, Texas.

NEGA's Belden honored

Clark Belden, managing director of the New England Gas Association, was honored recently by the American Society of Association Executives. During the group's 41st annual meeting held recently at French Lick, Ind., Belden received an award for outstanding service.

Belden was the only award recipient from New England among the society's 2100 members throughout the country.



You can tell a Metalbestos Man

by the Slide Rule he works with

That handy "slide rule" you see is actually a brand new service tool, the **Metalbestos Gas Vent Calculator.** With it, heating contractors can now accurately answer the most complicated venting questions in a matter of seconds. Think of the time it can save you on service calls, especially when troubleshooting gas heating problems. Then ask the nearest Metalbestos man where you can get your Gas Vent Calculator. No charge.

See your local Metalbestos representative or write Dept. P-2

AVAILABLE ONLY FROM METALBESTOS • Gas Vent Calculator • Reader's Digest Reprints • Color Slide Film "Heat in Harness" • Venting Schools • Vent Installation Handbook • Gas Vent Service Bulletins • Safety System Seals • Sales & Technical Literature • Ad & Article Reprints • Direct Mail Materials.

METALBESTOS DIVISION
WILLIAM WALLACE COMPANY
BELMONT, CALIFORNIA

MANUFACTURING PLANTS IN BELMONT, CALIFORNIA • LOGAN, OHIO

from page 77

Fight on for Toledo industry

In its bid to sell natural gas to Toledo, Ohio, industries, Panhandle Eastern Pipe Line Co. pledges to get industry for the city within 36 months or "kick us out."

Panhandle's general sales manager, James Sykes, made the proposal during a hearing before the city council's committee-of-the-whole.

He suggested a provision wherein Panhandle would produce at least one new industry for Toledo within three years or lose the limited franchise it seeks.

Panhandle originally sought to serve new or existing Toledo industry. But Ohio Fuel Gas Co., which serves the Toledo area, said this would permit Panhandle to raid Ohio Fuel's industrial customers, causing higher residential rates.

Panhandle agreed to limit its bid to new industry, although James Nestroff, the city's special gas counsel, said there is some problem in defining new industry.

Nestroff also said the new-industry-only limit might be legally questionable, especially if some existing Toledo industry demanded Panhandle service.

W. F. Laird, secretary and general counsel for OFG, said that if Panhandle comes in, his company's opportunity to serve new customers will be limited. If Ohio Fuel doesn't add industrial customers to balance increasing residential consumption, residential rates will increase, he added. Laird distributed a list of 38 major industries he said were added to Ohio Fuel lines "as a direct result of our own aggressive industrial development program."

He said Panhandle could undersell OFG because Panhandle gas has a lower heat content. Also, he said, Panhandle wouldn't pay a 3 per cent state excise tax, which Ohio Fuel does. Also, Panhandle wouldn't have to serve all customers.

Meanwhile, Michigan Consolidated Gas Co., Detroit, asked the FPC to block Panhandle efforts to sell gas at cut rates to Ohio and Indiana industries.

Michigan charged that the gas was accumulated after Panhandle cut off daily deliveries of 127 MMcf to Michigan Consolidated. This abandonment of service issue is still before the FPC after the U. S. District Court in the District of Columbia set aside the commission's order permitting it.

Mich Con charged that Panhandle misled the FPC by claiming it needed gas to serve utility and domestic customers, and then attempting to sell the same gas directly to industry.

Arizona PSCo. boosts state's growth

Arizona Public Service Co., Phoenix, has defined the four major factors in Arizona's growing economy and has put them in a four-color industrial brochure being distributed to 1000 major U. S. business firms.

Entitled "Introduction to Arizona," the vividly illustrated brochure was compiled by the utility's area development department.

Boosted are Arizona's chief sources of income—manufacturing, mining, crops and livestock, and tourists. The brochure also contains statistical information on the state which would be of prime concern to firms interested in locating there.

Springs PROVIDE EASIEST ACCESS TO METER & VALVE PITS!

BILCO DOORS have springs for easy opening and built-in drainage for complete weathertightness. Available in a variety of sizes in single or double leaf design.

FREE CATALOG WITH SPECIFICATIONS AND PRICES

THE BILCO COMPANY, DEPT. A-1911
NEW HAVEN 5, CONNECTICUT
Please send FREE catalog with specifications and prices on Meter & Valve Pit Doors.
NAME_____
FIRM NAME_____
ADDRESS_____
CITY_____ ZONE___ STATE_____

Bilco®
DOORS FOR SPECIAL SERVICES

Miami gas rates boosted—maybe

A 3 per cent increase in the gas bills of 18,000 Miami, Fla., consumers was approved by city commissioners under a franchise agreement. The increase must be submitted to the Florida regulatory body and to city voters at the November election.

Thus may be ended a two-year fight over Houston Corp.'s franchise (see July GAS, pp. 73).

The hike would come from a 6 per cent franchise tax the city would assess against Houston, as it does against other utilities in the city. In turn, Houston would pass half the tax along to its customers. Under the agreement, consumers also would have to pay a total of $89,000 in retroactive franchise taxes—about $5 per family—over a five-year period.

The state commission must approve the agreement providing the 3 per cent boost while city voters must approve the franchise itself. Currently, the commission is studying complaints that Houston's rates in the city are already too high.

City commissioners had urged that the company pay the entire $89,000 and not pass it on to its customers. However, R. Y. Patterson, assistant secretary and treasurer of Houston Corp., said: "We're operating in the hole now in Miami, and expect to operate in the hole for several years."

Pre-holiday promotion to be biggest

Newspapers are making plans for what is expected to be the biggest pre-holiday appliance promotion in the nation. The prediction comes from the Bureau of Advertising of the American Newspaper Publishers Association.

In mid-September, 336 newspapers in 257 markets in the U. S. and Canada were planning to participate in the second annual campaign, with the theme, "Make Your Home Happier With a New Appliance." The campaign is scheduled for Nov. 14-26 in most of the participating markets.

Joining in the campaign are utilities, appliances dealers, banks, department stores, and other local businesses. Reports indicate that utilities are highly enthusiastic about the promotion and are planning extensive advertising.

NORMAC

SELF LOCKING JOINT

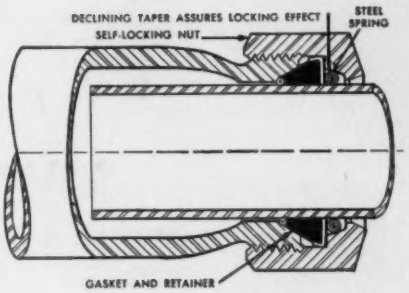
FULFILLS A NEED ON THE COMPRESSION END WHEN DANGER OF POSSIBLE PULL-OUT EXISTS!

AVAILABLE FOR ALL

NORMAC

COUPLINGS AND FITTINGS

In straight tensile testing machine tests, this unusual joint shows 8 to 30 times more resistance to pull-out, depending on pipe diameter, than standard compression joints.



The Greater the Pull . . . the Greater the Grip!

A declining recess in the specially designed nut of the NORMAC Self-Locking Joint contains a stainless steel spiral ring which fits the recess. Any outward pull of the pipe tends to roll the ring into the declining recess with increasing grip on the pipe! On services deflected in the ditch this resistance is magnified many times. Available in sizes ¾" to 2".

Write for detailed data, or inquire about possible adaptations of the NORMAC Self Locking Joint.

NORTON - McMURRAY Mfg. Co.

919 N. Michigan Ave • Chicago 11, Ill.

1897 1960

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN USED SINCE 1897 2" HANDLE & LOCKING SLEEVE GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

WARRENGAS
the Concentrated fuel
GULF GULFTANE LP-GAS
WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
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SALES OFFICES:
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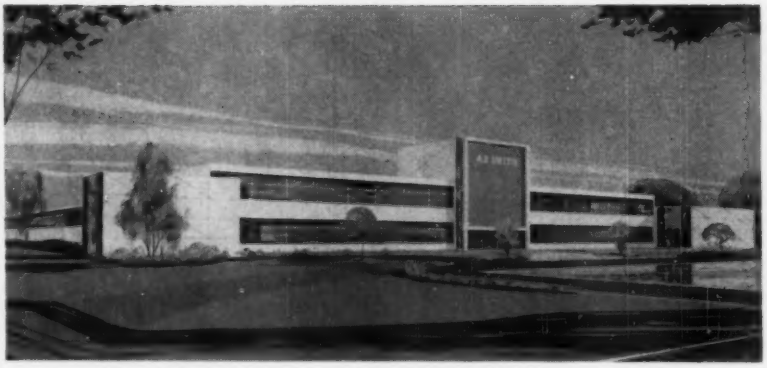
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MIDLAND, TEXAS
JACKSON, MISSISSIPPI
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA
TAMPA, FLORIDA
LOS ANGELES, CALIFORNIA
BRYN MAWR, PENNSYLVANIA

for LEAKPROOF
PRESSURE-TITE
Connections...
TiteSeal
SEALING COMPOUNDS
Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion and joint seizure.
BRUSH-ON
TiteSeal
LIQUID TYPE NON-HARDENING
GASKET & JOINT SEALING COMPOUND
7 BASIC BLENDS
LIQUID WRENCH
LOOSENS
RUSTED BOLTS
A powerful blend of fast-acting solvents that literally "melt the rust away" —safe on all metals and alloys.
RADIATOR SPECIALTY CO.
CHARLOTTE, N. C.

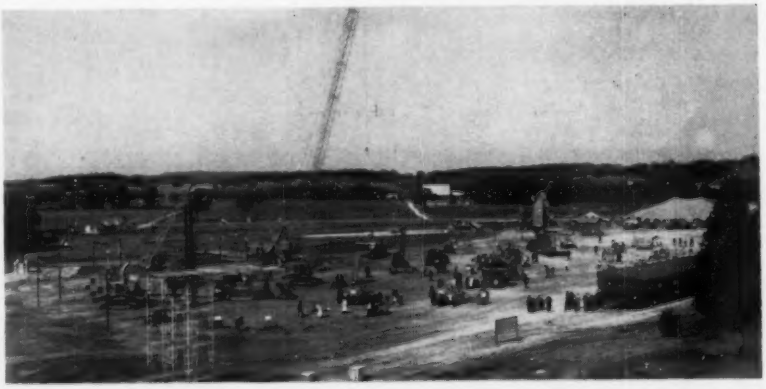
Newspix

Importance of the new Transwestern Pipeline Co. project to southern California was marked by a special Chamber of Commerce luncheon in Los Angeles recently. Happy about the event were (from left): William K. Warren, chairman of the board, Transwestern; Robert A. Hornby, president, Pacific Lighting Corp.; Stephen C. Bilheimer, vice president, L. A. Chamber of Commerce; and Ben Ramsey, Texas Lieutenant Governor.

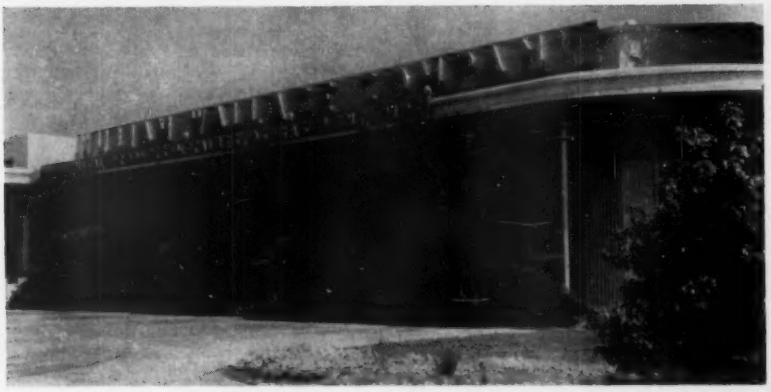


This is how A. O. Smith Corp.'s new advanced Research Center in Middletown, Wis., will look when completed next year. Research in the new labs will be devoted to advanced fields in solid state physics and physical chemistry of materials, as well as the energy processes involved in the use of such materials. New product developments will be undertaken also.

A gathering of construction machinery rivaling the equipment spread for a major expressway project went into action recently when Koehring Co. put on its 1960 construction equipment show. Some 40 construction machines built by seven Koehring divisions formed the equipment spread.



Venting pioneer marks anniversary



One of four buildings that cover William Wallace Co.'s 9-acre site near San Francisco. Here, sales, manufacturing and research programs of the company are directed. The company also has a plant in Logan, Ohio.

November marks the 35th year of the William Wallace Co., pioneer of double-wall gas vent pipe. In that period, the Belmont, Calif., firm pioneered a product, created a science, and grew 100-fold from its original capitalization.

The company's success is attributed to an engineer's conviction, an equation and a strong recognition of the dealer's needs. The engineer is Alan Kinkead, today president of William Wallace. Kinkead developed and pioneered the use of the Metalbestos double wall vent.

Representative named

Allis-Chalmers Pump division has named Luscombe Engineer as its southern California sales representative. The Luscombe firm is located in Pasadena.

90% cut in operating and maintenance cost means

CASH in the BANK for you!

New, transistorized M-SCOPE PIPE FINDER only $189.50

Rugged, transistorized construction practically eliminates maintenance cost . . . extends battery life to a year or more. Pinpoint accuracy, greatest depth penetration make the M-scope first choice in the field!

Send for FREE 1960 Catalog

FISHER Research Laboratory, Inc.

Dept. G-4, Palo Alto, Calif.

through!

Easy On! Easy Off!

REYNOLDS HOUSE SERVICE

8010 SERIES GAS REGULATOR

Inspection's a breeze with this versatile, popular Reynolds house service regulator. Exclusive V-band stainless steel coupling with a single screw allows simple 1-2-3 inspection as shown above: 1. Diaphragm case comes off easily. Valve body stays in line. 2. Valve disc and seat inspected. 3. All through! After screw quickly inserted in V-band clamp.

Now's the time to stock up on this fine house service gas regulator. For a look at our entire line, write for a free catalog.

4 models: Standard no-seal; automatic cutoff; full capacity internal relief; internal relief and automatic cutoff combined.

GEM

GAS CONTROL Since 1892

ARKLA

REYNOLDS GAS REGULATOR CO., INC., ANDERSON, INDIANA

A SUBSIDIARY OF ARKANSAS LOUISIANA GAS COMPANY

CSI

Practical ideas for BETTER Cathodic Protection

HOW YOU SAVE MONEY BY USING "HIGH POTENTIAL" RATHER THAN "STANDARD" MAGNESIUM ANODES

Why do you use magnesium anodes to stop corrosion of pipe lines, tank bottoms, oil well casing, etc.—rather than other types of galvanic anodes that sell for less money per pound?

The answer is, of course, because magnesium gives you a lower overall cost for cathodic protection. Magnesium's higher potential (approximately 0.4 volts) makes it possible to achieve protection with fewer installations.

If the above is true, then it follows that a "high potential" magnesium anode (delivering approximately 0.3 volts more than regular magnesium) can give you an even lower overall cost. This would be especially true if there is no sacrifice in useful ampere hours of current per pound.

Galvomag, the high-potential magnesium anode developed by The Dow Chemical Company, meets both of these requirements: It delivers 20 to 35 per cent more current than standard H-1 alloy magnesium anodes; and it has a current efficiency (ampere hour rating) comparable to H-1 anodes. Other so-called "high potential" and "high current" anodes tested, however, do not show current efficiencies in a comparable range.

To help you get the most for your magnesium anode dollar we suggest that you specify Galvomag or its equivalent in solution potential and ampere hour rating.

CSI engineers—pioneers in cathodic protection—have also developed a wide variety of special sizes and shapes to make Galvomag even more efficient. For example, the use of these special sizes in "hot spot" protection of pipe lines makes it possible to lower the number of anodes required by one-third —without decreasing the amount of protection or shortening the life of the installation.

It will pay you to check with CSI—for expert engineering and installation services, plus a complete line of cathodic protection supplies for both rectifier and anode installations. Prices are competitive. Call or write today.

CSI

Cleveland 13, Ohio
1309 Washington Ave.
Tel. CHerry 1-7795

CORROSION SERVICES INCORPORATED
General Office: Tulsa, Okla.
Mailing Address:
Box 787, Sand Springs, Okla.
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Name _____ Title _____
Firm _____
Street _____
City _____ Zone _____ State _____

New line serves Oregon's Willamette valley

Oregon's newly designated metropolitan area, Eugene and Springfield, has begun using natural gas, following completion of El Paso Natural's $10.5 million pipeline lateral in the state. The fast-growing communities now boast 105,000 population.

A recent public celebration in Eugene marked the arrival of natural gas. Leading the delegations from their companies were Paul Kayser, El Paso's board chairman, and Charles H. Gueffroy, president of the Northwest Natural Gas Co., distributing utility. Scene-stealer of the day, however, was Hollywood's Jayne Mansfield, who turned the ceremonial valve.

The 120-mile lateral, ranging from 20-in. down to 10-in. diameter, travels nearly the full length of Oregon's Willamette valley. It more than doubles the quantity of natural gas available to Northwest in its major marketing areas, with a capacity of 170 MMcfd. It taps El Paso's regional supply line near Camas, Wash., crosses the swift Columbia river 16 miles east of Portland.

Five gate stations supplying gas to Northwest—two near Portland's eastside perimeter, and one each near Salem, Albany, and Eugene. Northwest Natural is investing $3 million this year in tie-in lines and other facilities to take advantage of the new supply. This is in addition to its normal $5 million construction budget.

In Eugene and Springfield, natural gas has supplanted propane-air. Northwest's new construction is more intensive in this area than elsewhere. From the other four gates, the company has been able to boost supplies of gas four to nine times over what it could deliver in its own 30-year-old valley trunkline.

Fuel cell research launched by Battelle

Battelle Memorial Institute has launched a long-term research program to advance fuel-cell technology. The five-year program is described as "a major research effort being underwritten by some 25 companies."

Dr. John McCallum, project director, said the program "will be fundamental in nature."

Gas companies win franchise battles

GAS companies opposing municipal ownership advocates won two battles recently—both by vigorous public relations campaigns.

Houston Natural Gas Corp. won its franchise election in Corpus Christi, Texas, where it was pitted against the yardstick of an adjacent municipal operation.

The second battle was in Knox, Ind., where Northern Indiana Public Service Co. won its right to serve the community, 4 to 1.

Here is some background on the unique Corpus Christi situation: For 20 years, Houston Natural distributed gas in outlying areas of the city, starting with wartime service to the sprawling Corpus Christi Naval Air Station. Since 1922, the city itself has had a municipal gas utility—supplied first from local wells, then by Republic Natural Gas Co. Finally, in recent years, it was supplied by Houston Natural itself in the dual role of city gate gas supplier.

Several years of crises—spearheaded by the city's desire to grow through annexation — came to a head late in 1958. The city council decided to exercise a 1955 option to purchase Houston Natural's property within the city limits. It was the council's act which precipitated, at last, a decisive election vote on the company's future.

Houston Natural, however, was prepared for the battle. A long-range public relations program begun just after World War II, was put into high gear after 1954. Great emphasis was placed on the choice of able and friendly personnel. The company's area vice president made public relations his business. In fact, at the time of the election, he was president of the local chamber of commerce.

Two questions were to be decided by voters: (1) Should Houston Natural be granted a 30-year extension of its franchise? (2) Should a bond issue to purchase the company's plant be authorized?

In the time before the election, Houston Natural called upon its friends' resources and its own to organize what has become one of the most effective utility campaigns on record—with 90 per cent of it based on the proven good citizenship of the company.

A public opinion poll showed a 2:1 advantage for the company, but a substantial undecided vote.

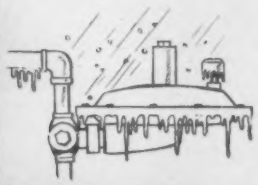
Just before the election, a series of newspaper ads featured the names of 273 prominent citizens who favored the company. Suppliers and other companies with whom Houston Natural had business associations wrote their friends—business and personal—among the city's voters urging a favorable vote for the franchise.

Employees throughout the company's system wrote or sent postcards to friends and relatives in Corpus Christi asking them to support Houston Natural. The same job was done by local stockholders.

On the eve of the election, the company went on TV and radio, reiterating its desire to continue to serve the community. On election day, radio and TV messages in behalf of the company's position were interspersed with simple nonpartisan pleas to vote.

On election day, the city voted 13:1 in favor of the franchise . . . a far cry from the 2:1 indicated majority. Some 2000 more votes than experts thought possible in this type of election were cast. The tally was 6095 *for* and 460 *against* the 30-year franchise.

UNIVERSAL



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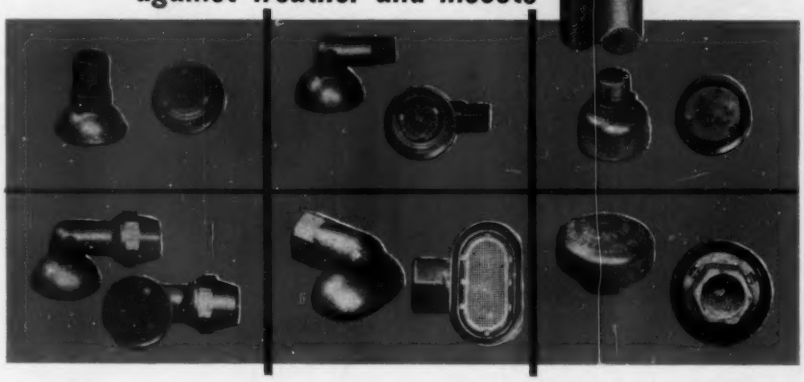

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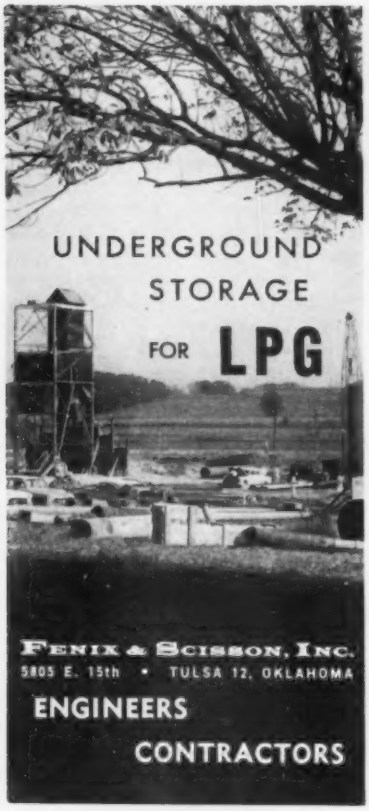

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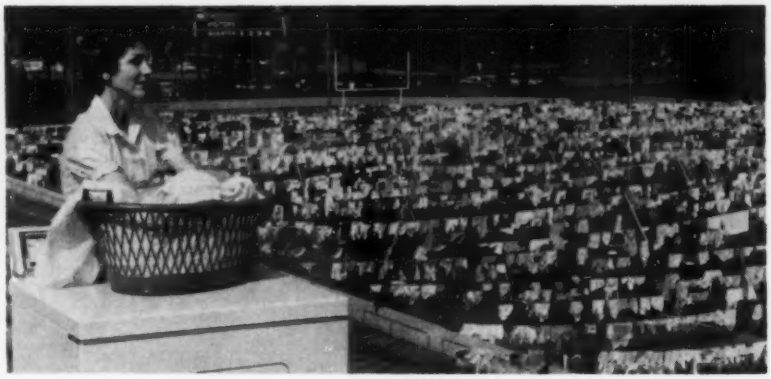

3-mile-long clothes line makes point

WHEN Michigan Consolidated Gas Co. wanted to show how much laundry is done in a year by a four-member family, sales promotion men had to hang up three miles of laundry. The only place big enough for the 7000 articles of clothing was the University of Detroit stadium.

Mrs. Geraldine Scott, the current Mrs. Michigan, was enlisted to pose with a basket of laundry and a gas dryer mounted high in the grandstand (top photo). The local press, television and *Life* magazine were invited along with appliance salesmen to take a look. The results were spectacular. All three Detroit newspapers ran 8-column cuts and gave credit to Michigan Consolidated and gas dryers in their story length captions. The smaller photo shows Jerry Seitz (left) and Wilbert Glines of Mich Con's sales department looking at their favorite pictures from the dailies.

The publicity preceded Michigan's "Dryer Dividend Days" sales promotion in which the company cooperates with appliance dealers.

Seitz, superintendent of sales training and promotion, dreamed up the idea, which met with enthusiastic approval from Glines, Detroit district sales manager, and Fred A. Kaiser, vice president and general sales manager.

NI-Gas completes line

Completion of a 75-mile pipeline has linked Northern Illinois Gas Co.'s Troy Grove underground storage reservoir with the heart of its main distribution system.

At first, the line will transport up to 100 MMcf from Troy Grove to help meet cold weather demands of more than 400,000 customers. This is about 94,000 more gas heat customers than a year ago.

WILL BUY YOUR GAS WATER HEATER PLANT, ANY TYPE!

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Northern States extension okayed

North Dakota's PSC approved Northern States Power Co.'s plan to provide natural gas service to southwest Fargo and west Fargo. NSP will spend about $385,000 during the next three years on new facilities. Gas will move through a feeder line from Fargo, already served by NSP.

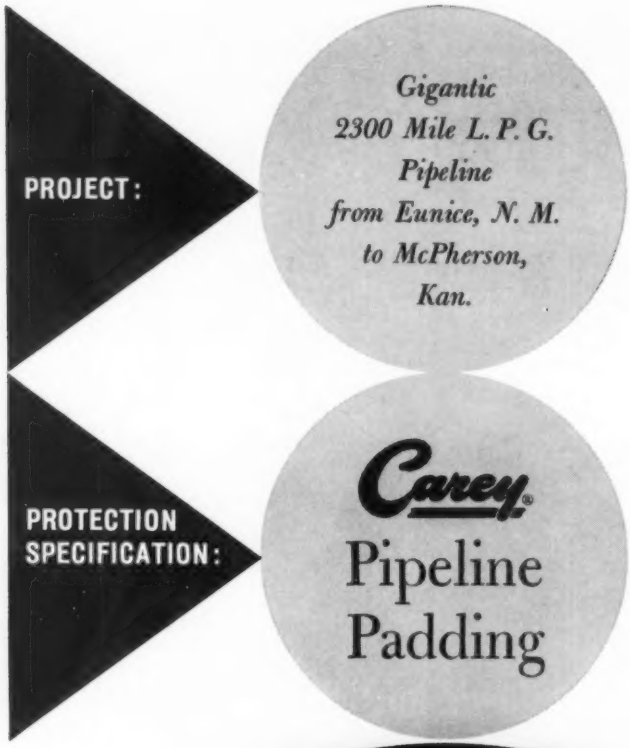
The commission said Northern States has an adequate supply of gas under its contract with Midwestern Gas Transmission to supply the two communities for 25 years.

Service is expected to get started by Nov. 15.

GAS

PIPELINE SECTION

CONTROLLING GAS HYDRATES



Each day, 60,000 barrels of liquified petroleum gas rumble through this new line from Eunice to McPherson, and through its two great arms extending far north to Minneapolis, Minn. and Madison, Wis.

Perrault Supply Company, Tulsa, Oklahoma, provided Mid-America Pipeline Company with carloads of Carey Pipeline Padding for sure protection of this giant line through the most rugged terrain. Specify Carey on *your* next line—America's first and finest pipeline padding. Write Dept. GA-1160 for complete information.

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CONTROLLING GAS HYDRATES

By L. E. CONNEALY
Texas Eastern Transmission Corp., Shreveport

SINCE 1953, Texas Eastern Transmission Corp. has operated the world's largest wet gas gathering system, first as a subsidiary, and now as a part of one of its six divisions. With that first winter of operation came the first formation of gas hydrates. Since this was anticipated, methanol drips had been fabricated and were ready to be installed as hydrates formed. When these drips proved unsuccessful, another method of introducing methanol was needed. The search began with a review of the composition, causes, and control possibilities of hydrates.

omposition of hydrates

Gas hydrates were discovered by French investigators as early as 1888. Before hydrates were understood, "freezes" in gas pipelines were attributed to water ice. When such freezes occurred under conditions where water ice couldn't possibly form, some other explanation was sought.

Subsequent investigation disclosed that every natural gas will form a hydrate when the conditions of pressure, temperature, and water content are satisfied. For example, a natural gas at 1200 psi, saturated with water vapor, will form a hydrate at 64 deg F. A similar gas at 600 psi will form a hydrate at 56 deg F. Physical changes, such as turbulence of the gas and variations in water content, will change this temperature.

The importance of these changes depends on the type of gas system involved. When operating a two-phase system of gas and liquids (hydrocarbons and water), hydrate formations occur much more readily and frequently than on a pure natural gas system and greater precautions should be taken.

The exact nature of hydrates may not be known to this day, but authorities suggest they are definite compounds of a single molecule of hydrocarbon with several molecules of water. Because of their instability (except at low temperatures and high pressure), it is difficult to obtain a sample to analyze for exact composition. Further, hydrates are sure to be permeated by unknown amounts of hydrocarbon and water, making an accurate analysis more difficult.

A close approximation of the composition of hydrates is known, but there is difference of opinion whether a hydrate molecule holds six or seven molecules of water for each hydrocarbon molecule. This hydrate molecule can be written as a formula, $M \cdot 6H_2O$. M represents one molecule of the gas under consideration.

Regardless of their composition, hydrates of methane, ethane, and propane do exist. Hydrates of the heavier hydrocarbons may exist, but conditions favorable to their formation are also favorable to ordinary ice, which might be formed instead.

auses and consequences

The nature of the force holding the water molecules is not known, but it is no stranger than the water of crystallization in copper sulfate ($CuSo_4 \cdot 10\ H_2O$) or the affinity for water of various other inorganic substances, such as $CaCl_2$ or silica gel. We know that a hydrocarbon, in the presence of water vapor and under certain conditions of temperature and pressure, has an affinity for water vapor and will combine with it, forming an ice-like substance. Whether this is a coordinate sharing of electrons or the existence of "auxiliary valences" is not known at present.

It is known that for each operating pressure, there is an equilibrium temperature above which hydrates cannot form, and below which they may form. Turbulent conditions, and the presence of liquid water and hydrocarbons, influence hydrate formation, changing the forming temperature.

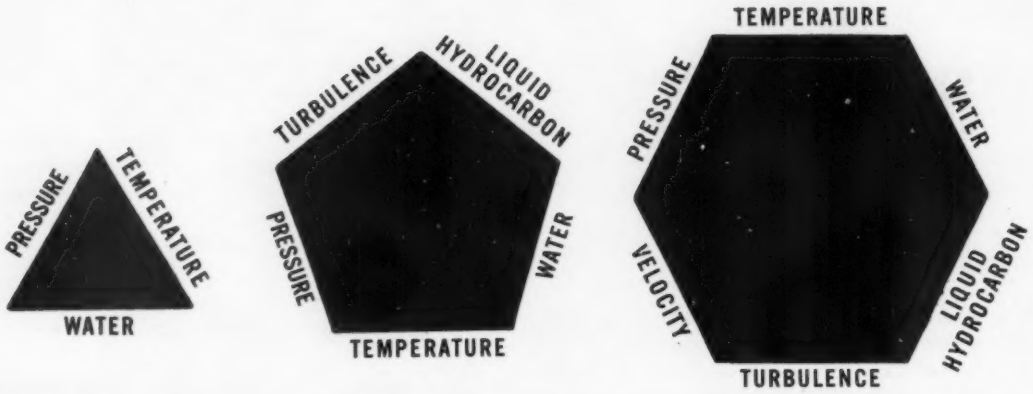
The equilibrium temperature varies for different hydrocarbons. The temperature is lowest—and the corresponding pressure highest—for methane. Ethane hydrates can form at higher temperature and lower pressures while the conditions for propane hydrates are still easier to meet.

Saturation with water vapor is all that is required for hydrate formation. But, if water vapor is all that is present, the amount of hydrate will be small. However, if the gas temperature is lowered by a pressure drop, such as at a regulator station, chances of hydrate formation are greater. After the first crystal, formation proceeds rapidly until the materials are exhausted.

If a hydrate is trying to form in a line, it will be evidenced by either a larger than normal pressure drop along the line, or by gradual or sudden orifice meter chart pressure rises which sometimes return to normal as the hydrate breaks loose.

When a hydrate is allowed to form, it can be broken by reducing the line pressure. It might be necessary to reduce the pressure and leave the line out of service for an indefinite period. This may not always be

Geometric figures illustrate conditions for hydrate formation in gas systems



Triangle Represents Basic Hydrate Formation

Pentagon Represents Hydrate Formation in Two-Phase System

Hexagon Represents Hydrate Formation in Two-Phase System Operating at High Thruput

practical when the gas that would normally flow through the line is needed to supply a customer.

A more practical method when a portion of the system is blocked is to isolate it, blow to atmosphere to clean the hydrate, and follow the blow-down with a good purge. This permits you to keep most of the system in service; but gas is lost to atmosphere and in purging and it takes considerable employee time. Also, a hydrate may form at any time of the day or night, requiring round-the-clock vigilance.

Hydrate formations in several gathering lines at one time can curtail gas flow to the point that deliveries will be well below the amount requested. When this occurs, adjustments must be made at other facilities to supply customer demand. This means adjustments at compressor stations and among all employees who keep gas flowing into and through the pipeline. Other repercussions are multiplied in importance.

As the producer is obligated to keep his gas flowing from the well into the system, so the system is obligated to extend every effort to keep operating to permit the wells to flow. There should be no lengthy interruption of service to cause monetary loss to either party.

Not only do hydrates present an obstacle to satisfactory gas flow, but they also present a serious hazard to workers and pipeline facilities. Wellhead pressures are quite often very much greater than the operating pressure of the pipeline; and when a hydrate block occurs, this pressure is applied to the pipeline. Normally, automatic pop valves on producers' equipment will not allow this pressure to exceed the pressure rating of the pipeline, but any automatic device can fail. If these high pressures are in the pipeline, relieving them becomes a greater hazard to the workers.

ontrol possibilities

There are four possible ways to control hydrate formation: remove water from the gas stream, keep the gas at a temperature above the hydrate point, operate at a low pressure, or introduce a hydrate-preventing substance.

Heating the gas stream with in-line heaters will prevent hydrates, but this has cost drawbacks. Heat is especially good for special applications, such as steam tracing of regulators, or electric heating elements on measuring stations or regulators. A small combustion-type radiant heater could heat regulating and measuring stations, but heat—as an exclusive method of preventing freezing—would be uneconomic when the marketable product is used as fuel.

Injection of glycol into a wet gas system will effectively prevent hydrate formation. Glycol is a high hydroscopic liquid and a highly effective antifreeze. When present in sufficient concentration, glycol will cause additional liquefaction of water vapor, possibly dehydrating gas to some degree. Because glycol is completely soluble in water, smaller quantities are required, compared to methanol, which, because of its high vapor pressure, loses an appreciable portion in the vapor phase of the gas flow.

Because glycol remains in the liquid phase, it can be separated at central points along the line, reconcentrated, and reused. However, special equipment

Glycol's Line-Coating Habit Gets Expensive

SIZE LINE	QUANTITY NEEDED TO COAT 1 MILE	QUANTITY NEEDED TO COAT 10 MILES	COST FOR 10-MILE LINE
3 In.	103.5 Gal.	1035 Gal.	$1552.50
4 In.	138.0 Gal.	1380 Gal.	$2070.00
6 In.	207.0 Gal.	2070 Gal.	$3105.00
8 In.	276.0 Gal.	2760 Gal.	$4140.00
10 In.	345.0 Gal.	3450 Gal.	$5175.00
12 In.	414.0 Gal.	4140 Gal.	$6210.00
14 In.	483.0 Gal.	4830 Gal.	$7245.00
16 In.	552.0 Gal.	5520 Gal.	$8280.00

will be required at considerable expense. Using glycol means special operating procedures. Reconcentration equipment will be subject to fouling, corrosion, and sealing by salts dissolved in the water produced. Provisions should be made to remove extraneous material, especially dissolved salts. Possible solutions would be a sufficient number of towers to enable removal of one or more from service for cleaning, or a salts-removal step in the reconcentration process.

There would be some glycol loss by solution in the hydrocarbon portion of the flow. Normally, this loss will not be appreciable, since the hydrocarbons involved are of the paraffin family, but it would increase when aromatic hydrocarbons are encountered. Solution loss also depends on temperature, and concentration of the glycol-water mixture.

Glycol has a characteristic which causes it to cover the pipe wall with a thin coating. The quantity used in this fashion is approximately 34.5 gal./in./mile. When we consider that glycol costs from $1.50 to $2 per gal., it becomes obvious a considerable expense is involved, especially for large diameter lines. (See accompanying table.) Also, the glycol coating decreases the effective diameter and probably decreases pipeline efficiency, depending on the through-put efficiency of the line.

A factor to be considered when choosing the injection material is the type of dehydration used at the terminus of the system. Methanol will have no deleterious effect on either glycol or dry-bed dehydration. But glycol might foul a dry-bed. However, if glycol dehydration is used, there would be no difficulty.

Glycol might prove successful as a hydrate preventor. Its use should be practical and feasible, if the gas system is designed for glycol injection, recovery, and reconcentration. In an older system, converting from in-line heaters or methanol injection might prove too expensive.

Injection of methanol is perhaps the most common method of preventing hydrates in wet gas systems. If methanol (or some other hydrate inhibitor) is injected, the freezing point will be depressed in direct proportion to the amount of inhibitor. Hammerschmidt has expressed this phenomenon by a mathematical equation:

$$d = \frac{K\,W}{100M - MW}$$

d = freezing point depression, deg F
K = a constant whose value depends on the solute and must be determined experimentally
W = the solute (inhibitor) concentration, weight per cent
M = molecular weight of solute (inhibitor)

The freezing point constants of popular hydrate inhibitors are:

Substance	K
Methanol, ethanol, isopropanol, ammonia	2335
Ethylene glycol, urea sodium chloride	2200
Ethylene glycol, propylene glycol	3950
Diethylene glycol	4367

Methanol is an effective antifreeze. It is non-corrosive, chemically inactive, soluble in all proportions in water, easily obtainable, and reasonable in cost. Methanol will establish an equilibrium with most of it in the vapor phase. But, when the liquid phase is encountered, it will condense sufficiently to establish an equilibrium. Some authorities believe

Three Winters of Hydrate Control Progress

METHANOL USE UP SLIGHTLY

MONTH	AVG. SUCT. TEMP. THOMASTON 57-58	58-59	59-60	GAL. METHANOL INJECTED 57-58	58-59	59-60
November	66°*	68°*	69°*	3,456	2,243	9,444
December	59°	61°	62°	12,680	17,295	19,298
January	56°	55°	58°	26,441	35,134	24,361
February	54°	57°	57°	31,188	28,011	25,448
March	57°	61°	57°	22,068	17,082	34,746
April	64°	64°	63°**	6,917	1,784	2,230**
TOTAL				**102,750**	**101,549**	**115,527**

*This represents the entire month of November.

**These figures represent the first ten (10) days of the month.

methanol is most effective when atomized at injection, but considerable success can be had without atomizing. Best results with greatest economy are obtained when methanol is introduced by injection pumps in small amounts on a 24-hr-per-day basis.

All in all, methanol is the simplest compound to use as a hydrate preventor. But, it is lost as additional Btu since no method has so far proved practical to recover it.

Close-up of the TET set-up

Methanol is used by Texas Eastern. The techniques worked out have been quite effective in preventing hydrate formation and enabling wet gas to flow during severe winter weather. Usually, methanol is injected at measuring stations on laterals which connect into the mainline system.

Texas Eastern's wet gas system is composed of 145.35 miles of 14-in. and 16-in. main with a 16-in. loop 16.32 miles long and 254.01 miles of laterals varying from 3 in. to 8 in. The laterals form a network along the mainline, and many have branch lines off branch lines, making a very complex system.

This system is unique in that all liquids entering or condensing in the lines are transported the full length of the line to a gasoline plant because of an agreement with the plant. At compressor stations, the liquid is separated from the gas stream before compression, then forced back into the line after the gas has been compressed. Water that settles out at compressor stations is blown to disposal pits.

Most hydrate problems occur on the laterals. During winter months, methanol is injected principally at meter runs, since they are at the beginning of the lateral. On some laterals, particularly those with loop lines, additional methanol must be injected at points along the lateral. Methanol injected into the laterals naturally travels with the gas stream and prevents freezing in the mainline.

It is most important, of course, that the mainline be kept free of hydrates, for a hydrate block there would curtail all gas deliveries. The loss of minor gathering lines or a main lateral by hydrate block is not nearly so critical, as a small portion of the system can be isolated from the main portion and cleaned easily. During periods of extremely cold weather, it is therefore sometimes necessary to introduce extra quantities of methanol into the mainline. This can be done at pig traps, at mainline blow-offs, or at any appurtenance on the mainline. It is impossible to estimate the exact amount of extra methanol that will be required, so sufficient quantity must be used to insure complete safety.

When gas reaches a compressor station, hydrate troubles may be evidenced, their formation perhaps accelerated by suction turbulence. Methanol pump facilities must be provided to prevent hydrates forming in gas-liquid separating equipment. Sometimes an excessive pressure drop will occur because hydrates try to form in the liquid separator, but methanol injection quickly breaks up the hydrates. At one location, a pump is hooked up to automatically inject when the pressure drop exceeds two points. During the

HYDRATE BLOCKS, BLOCK-CLEARING OVERTIME DOWN DRASTICALLY

MONTH	LATERALS FROZEN			HOURS OVERTIME	
	57-58	58-59	59-60	58-59	59-60
November	8	6	17	0	0
December	39	75	26	160	35
January	105	112	52	445	83
February	101	59	52	88	69
March	57	15	57	14	59
April	2	0	0	9	0
TOTAL	**312**	**267**	**204**	**716**	**246**

most severe winter weather, the pumps at compressor stations operate at low rates at all times and at higher rates when the incoming gas stream becomes colder.

Measurement of wet gas becomes much more of a problem during the winter months, since hydrates can form in the meter run or the meters themselves. Hydrates have been forced through our meter runs with enough force to break loose straightening vanes and break off thermometer wells. Each winter, hydrates buckle orifice plates when forced through the meter run into the pipeline. So on wet gas systems, it might be wise to design meter runs without straightening vanes and to install thermometer wells at an angle offering less resistance to hydrate flow.

At measuring stations where gas is delivered above hydrate formation temperature, there will be very little freezing in the primary measuring element, but there will be freezing in the secondary element or meters. To prevent freezing in the meter run, the temperature of the gas must be raised with an outside heat source, or an antifreeze must be injected. Hydrate formation will occur principally when the ambient temperature is low. Therefore, it is difficult to determine remedial action. This is especially true in south Texas, where the daytime ambient temperature is mild except for a few days each year. If gas enters the meter at a temperature near the hydrate point or below it and there is no anti-freeze injection, it is almost impossible to keep it flowing. Also, frequent freeze-ups in the meter run orifice taps will make it extremely difficult to get a readable and meaningful chart record.

Preventing problems with meters is more difficult and requires considerable expense. The meter should be as close as possible to its taps with piping installed to permit fluid drainage back into the line. Installation of condensing chambers, overhead piping, and insulation (to hold heat) will all help. All leaks in meter piping must be eliminated and a high quality valve should be used for meter taps and manifolding. We find steel tubing, combined with condensing chambers, serves meter manifolding needs most adequately.

Bellows or diaphragm-type orifice meters are recommended for wet gas measurement. Using a seal of equal amounts of glycol on each side of the bellows and locating the meter as near the orifice as possible will eliminate most meter freezing, especially in south Texas.

Mercury meters measuring wet gas require considerable time and expense to keep operating during winter. However, careful attention to their piping and using good valves and condensing chambers will keep maintenance at a reasonable level.

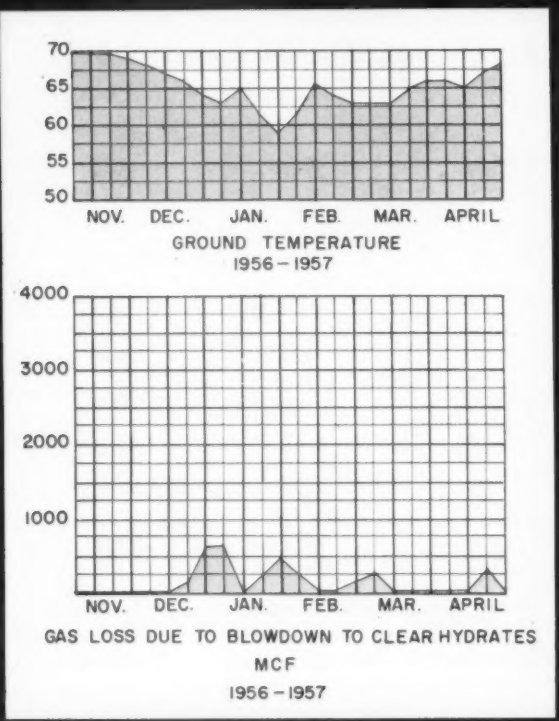
In winter, all wet gas measurement problems are intensified. Pipeline, measurement, and compressor station work is more complicated and critical.

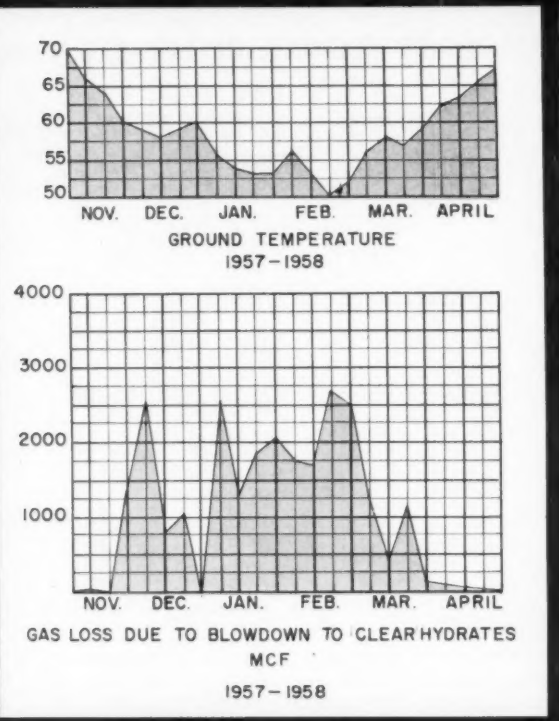
To prepare for winter, a meeting of field personnel at headquarters is invaluable. Personnel in each area can bring up individual problems and predict where trouble will occur and how the winter might be different from previous ones. Knowledge gained the preceding winter can be reviewed and shared by all and a better plan will be formed for the coming winter.

Each year, new areas give trouble—and sometimes old trouble points disappear. Field forces are familiar with changes in producing characteristics of individual wells. With this informaton and that of other departments, a workable plan can be established.

It is most important to know the location of each methanol pump and to have an injection rate to start the pump when conditions demand. Each pump should be repaired and checked to be sure it is in good condition before winter operations start. Because most pumps are delicate machines, they must be protected from contamination by dirt, rust, and other foreign material. Their methanol reserve tanks must be pro-

Four-Winter Comparison of Relationship between





tected from corrosion, so each should be filled with a rust inhibitor during the idle months.

After winter plans are formulated and all field equipment is set, you need a criterion for beginning injection. The best guides are the ground temperature or suction temperature at compressor stations, since they reflect the flowing gas temperature at pipeline depths. Locations which have given the most trouble in the past may require special consideration. A troublesome lateral line may be cleaned with pigs, or methanol may be injected before the hydrate point has been reached, creating an equilibrium with liquid lying in the lateral.

Last winter, we decided to begin injection at low rates on troublesome laterals, well ahead of the hydrate season. This proved successful in nearly all cases. If one knew the exact amount of fluid in each lateral, it would be feasible to start injection at a preset time and the transition between winter and summer would be relatively smooth. Because such information is not available, it is necessary to proceed by trial and error.

For locations without a history of serious hydrate problems, injection should be started as soon as the ground temperature reaches a pre-set minimum. This will not completely eliminate freezing, but operations will be simplified and fewer complications will arise. There is always the possibility that some methanol may be wasted by beginning injection before it's needed, but in most cases the loss will be small compared to the increased ease of operations.

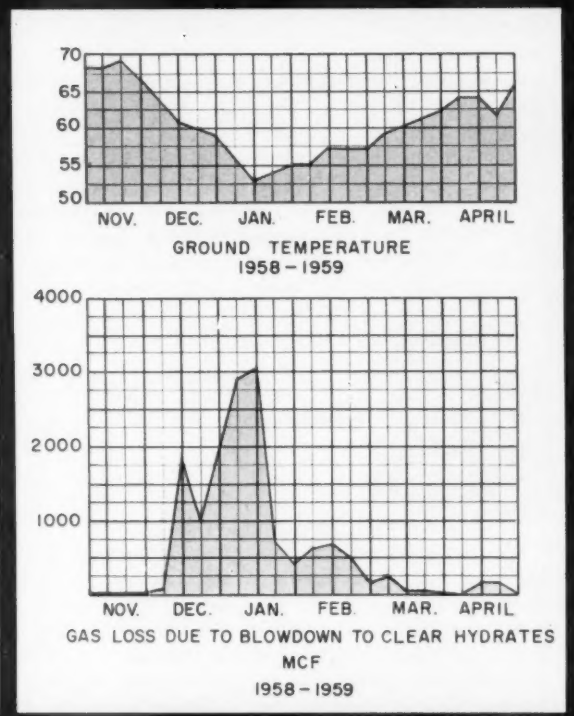
Prior to last winter, very little injection was done on laterals before freezing was found. Our experience last winter indicates that careful planning pays. When you think about the conditions that exist in a lateral after a hydrate has formed, the folly of permitting it to form becomes apparent. After it is cleared, the line purged, and methanol injection begins, further hydrates can form in most of the lateral. This condition remains until an equilibrium has been reached.

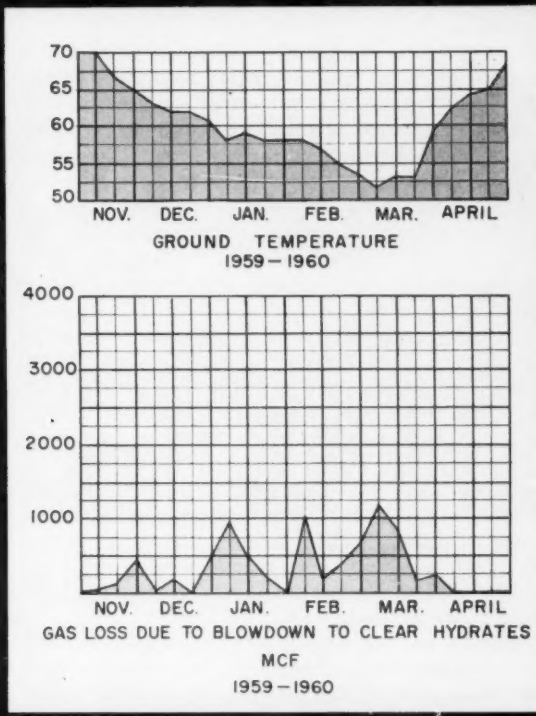
After an adequate injection rate has been set, it should be maintained as long as temperatures remain the same. When ground temperature drops, the rate should be increased. On days when the ambient temperature becomes fairly high, there is a tendency to lower pump rates, but this is false reasoning since ground temperature determines gas temperature in the line.

Injection rates are so variable that they can't be stated exactly. Some wells flow wet gas winter after winter and offer no freezing problems except under exceptionally cold conditions. Some can be kept flowing by addition of 2 to 5 gal. of methanol per MMcf while others may require 5 to 20 gal. per MMcf. One rule of thumb is a minimum of 5 gal. per MMcf on a lateral from 500 to 1000 ft long. On shorter lengths of 3-in. lateral, 2 to 5 gal. per MMcf may prove sufficient. Rates depend on: site and length of lateral, ruggedness of terrain, and amounts of water and hydrocarbon produced by the well. Because it is not possible to locate a pump on each well, individual pump rates are adjusted to protect their portion of the system.

When several wells produce into a gathering system

Ground Temperature and Hydrate-Clearing Gas Loss





of various lateral sizes, the methanol requirement is influenced by water and hydrocarbon which condense and remain as liquids in the lines. The amount of liquids accumulating increases with the lateral's length, the number of swags and dips, and the amount of gas flowing (and keeping it swept clean).

A gathering system designed to handle 10 to 15 MMcfd will probably require more methanol if the flow rate drops below that figure. Such a decrease can be anticipated as wells die or age. Portions of a system originally designed for 10 MMcfd may handle only 1 MMcfd—and from as many as five different wells through different sized laterals of various lengths. During winter operations this can cause considerable hydrate trouble. When hydrates must be cleared, systems with such small through-put present additional problems. There is insufficient purge gas so it takes too long to repressure the lateral, return it to service, and ascertain whether the hydrate will reform.

On some portions of Texas Eastern's system, one well is left producing into a lengthy line. Extensive preventive measures are required to keep such wells flowing in winter. The methanol required by one isolated well can approach that for several wells in a network.

It is not necessary to install pumps on each lateral of a system because methanol will move along with the gas stream. However, as gas from additional wells enters, the effectiveness is diluted, so pumps should first be located at the furthermost points of the system. The furthest pumps should start first, and as ground temperatures drop, the other pumps should start. Pump rates are then adjusted to insure adequate methanol for flow.

An equilibrium can be in effect along a lateral and still sufficient hydrates form. This occurs when the gas in equilibrium reaches the tap or check valve, where sufficient turbulence is set up to precipitate formation. No amount of planning can prevent hydrate formations of this sort, but if they are discovered before the lateral is completely stopped, a few gallons of methanol at the tap valve location will clear the line.

Unfortunately, even when the best plans are made and great attention is paid to preparation, hydrates still form. Meter charts coming in from the field indicate which locations are giving trouble. By using chart information, injection rates can be adjusted and potential pump locations are indicated. It is not possible to locate pumps in every spot where trouble occurs, but enough should be installed to keep main laterals free.

When freezing occurs on laterals supposedly receiving sufficient methanol, they must be isolated and blown down. It is sometimes helpful, after a hydrate is cleared, to put several gallons or barrels of methanol (depending on the size of the line) ahead of the purge gas—to distribute methanol along the line. When the lateral has been returned to service, pump rates should be adjusted to prevent hydrates from forming again. An excessive rate for a few days will establish an equilibrium in the line and then can be lowered.

When pressure is bled off a line containing a hydrate block, there can be a pressure drop of several hundred

pounds across the block and it will still not break loose. The block then has a terrific force when it does break loose. When freeing a block, it is best to relieve pressure on both sides to prevent this unsafe pressure differential.

If two crews work on each problem, they can maintain close attention to pressures on both sides of the block. In most instances, two crews are not available and other safeguards or arrangements must be made. An economical and practical remedy is a walkie-talkie, making one two-man crew work as two.

It is very important that each crew be supplied with sufficient and proper hand tools, automotive equipment, and pressure gauges and have good communications. Most important in this dangerous and technical work is intelligent and well trained personnel. Technically trained men can be more readily taught to respect the potential dangers and to figure out field problems as they arise. Texas Eastern uses its measurement engineers, who are technically trained and have a college background, to handle hydrate problems.

To insure that all pumps function properly, they are checked frequently. Since reserve tanks at each pump are necessarily of small capacity, they are refilled at frequent intervals during hydrate months. When crews make regular checks at pump locations, they know how well the pump has been performing by its methanol consumption.

Producer's well attendants often report pump stoppages to dispatch headquarters, and maintenance personnel immediately make repairs. A hydrate condition can develop in a few hours, making it very important to keep all field equipment operating at all times and to repair equipment as soon as it is reported out of operation.

Each pump installation costs $200 or more and must repay that investment. Different capacity pumps are needed because of varied requirements, but the remainder of the equipment is fairly standard. Reserve tanks, racks, hose, regulators, drop bottle, and copper tubing are used in each hook-up. Because most of the equipment is used year after year, there isn't much expense each winter.

On the other hand, winter expenses on an unprotected wet gas system can become astronomical. Employee overtime can amount to several hundred dollars a week to clear hydrates. Employees highly trained in maintaining pumps and the system can be expensive. Further, gas blown to the atmosphere is lost gas and lost profit.

Of course, it is not practical to spend more money gathering and transporting gas than it will bring as a salable product. But, it is necessary to protect, within reason, the initial investment. We prepared the accompanying graphs and charts comparing gas loss to atmosphere and other factors for previous winters with the 1959-60 winter.

We believe that the 1959-1960 winter was Texas Eastern's most successful so far as pipeline operations, gas measurement, and hydrate control are concerned. We had 60 fewer hydrate blocks to clear and our gas loss to clear hydrates was one-half the previous winter. This was accomplished under unusually severe weather conditions. We believe our success was due to advance planning, starting injection before hydrate troubles began, and because our pump rates were constant. Measurement engineers were able to keep up with their measurement work, because they were not working with hydrates as much as previously. There were considerable savings in overtime hours. It was also possible for employees to accomplish this work during daylight hours, when handling high pressures is much safer.

Several innovations were made last season and they should benefit us this year. Different pumps were tried. They will be more economical to maintain and will require less gas. Small capacity pumps, up to a maximum of 10 gal. per day, proved successful on short laterals that had been a daily hydrate problem.

Conclusion

Texas Eastern has shown it is possible to maintain required flow rates during winter months. Considerable difficulties with the two-phase system were overcome, and hydrates are being effectively controlled by methanol injection. It is possible that another method of hydrate prevention would prove more economical, but our studies have not been able to prove so. Any change would have to promise big savings.

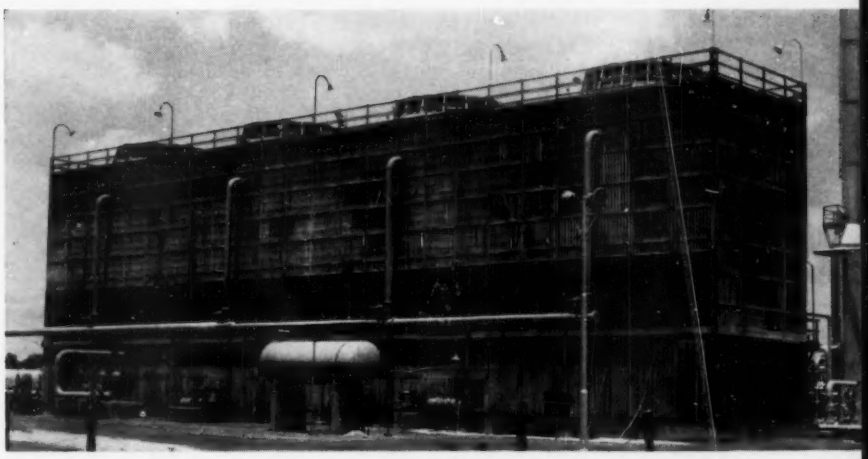
Many of the problems on a wet gas system would be simplified if the pipeline design would recognize the special problems of wet gas. Pig traps on major laterals would make it possible to sweep condensed liquids out just before the hydrate season begins. Gate valves used for tap valves (rather than plug valves) would remove a source of turbulence and pressure drops that encourage formation of hydrates. The economics of various antifreezes should be investigated and the system designed for a particular type. If methanol is used, spray nozzles should be provided or allowed for at potential injection points. However, pumps and other related equipment might be sized better if purchased after the system is in operation. On existing systems having hydrate problems, it would be wise to study the use of heat, glycol injection, and methanol injection to determine which would be the most economical and practical method. Glycol injection would be very effective, and it is quite possible that an economical and practical method could be developed. The main drawback is the cost, but if glycol could be recovered, this might disappear.

All the methods mentioned are effective, but economics and application determine the choice. On an older system where one method is in operation, it might be too costly to change.

The success of any system will be dependent, to a great extent, on training personnel and developing operating techniques. New ideas and innovations are needed for effective, up-to-date operations. ■

Adapted from 1960 Short Course in Gas Technology—Texas College of Arts & Industries, Kingsville, Texas.

Six years without rust or corrosion



ABOVE: Cooling tower at Goliad's Wilcox Plant at Provident City, Texas, is in operation 24 hours a day, 365 days a year. Downtime in 6-year period averaged less than half of 1%.

Protecting steel in a cooling tower

By CRAWFORD BLANCHARD, Superintendent, and M. H. SELBY, Maintenance Foreman
Goliad Corp., Provident City, Texas

IN common with other refiners of petroleum products, we find need for protection of steel pipe, tanks and structures in certain areas against rust and corrosion, which take a costly toll of plant equipment.

In 1954 when installing a new cooling tower at the Wilcox Plant at our Provident City field, this problem was studied again. Corrosion in a gasoline plant is most severe in and around the cooling tower. In the tower, condenser coils carry the hot hydrocarbon gases. They are cooled by cascading water continuously over the coils at the rate of 10,000 gpm.

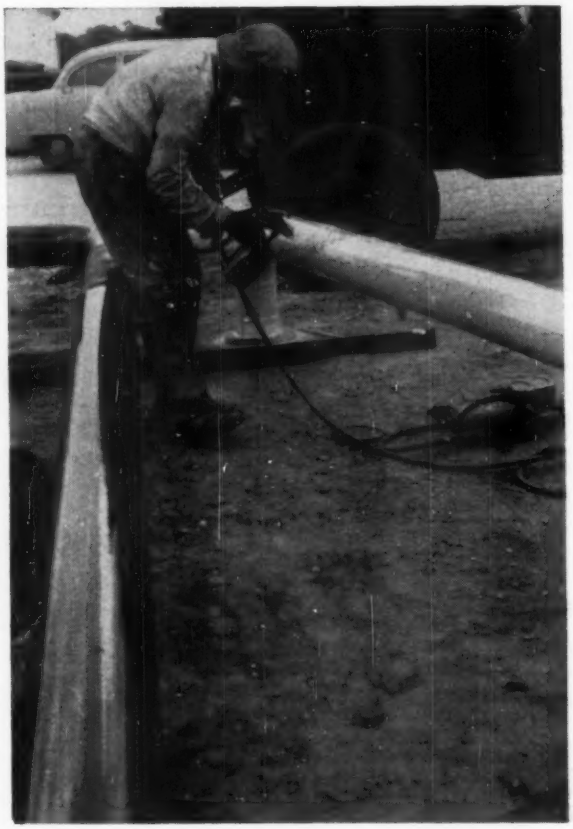
Like most Texas water, our cooling water is alkaline. To neutralize it, so as to avoid build-up of calcium scale on the coils which would retard heat transfer, we treat it with sulfuric acid. A corrosion inhibitor is also added. After treatment, the water has a pH of from 6.2 to 6.5, which is on the acid side.

• Protects in concentration cell corrosion

Water is pumped over the coil through a series of spray heads. The worst corrosion occurs at outer edges of the spray, where splash, spray and mist may extend as much as 40 ft away from the tower. Steel is subject to severe corrosion throughout this area. Alternate wetting and drying deposit calcium scale sometimes as thick as 2 in., even from treated water. Moisture pockets form under the scale, and corrosion is accelerated in these pockets by what is in effect a series of concentration cells.

Pipe in and around the cooling tower that is not protected by a coating has been destroyed by corrosion within two years. Unprotected piping is subject to replacement in from 18 to 24 months. Yet conventional coatings have not proved very effective under such severe service.

RIGHT: Nearest pipe has received priming and second coats of epoxy coating. They will cure for 24 hours before finishing coat is applied.



In our search for a solution to this problem, we tried an epoxy resin coating in 1954. This coating and the pipe it protects are still in service six years later. Both are in good condition, although in some areas there is a deposit of scale over the coating. But there are no moisture pockets under the scale. Our downtime after all these years has been less than half of 1 per cent. Failure of the coating has not occurred.

The epoxy coating we selected is Plasite 7122, a high-solids content, amine-cured material formulated by Wisconsin Protective Coating Co., Green Bay, Wis. The formulation is based on Shell Chemical Co.'s Epon (R) resins.

• Bonds strongly to steel

In spite of thermal shock conditions present in our operations, this coating has shown unusually good adhesion to steel. Hydrocarbon gases and liquids passing through the cooling coils customarily range from 195-230 deg. F. On occasion, gas temperature may rise to 400 deg F. With cooling water at much lower temperatures, these conditions place a premium on bonding strength.

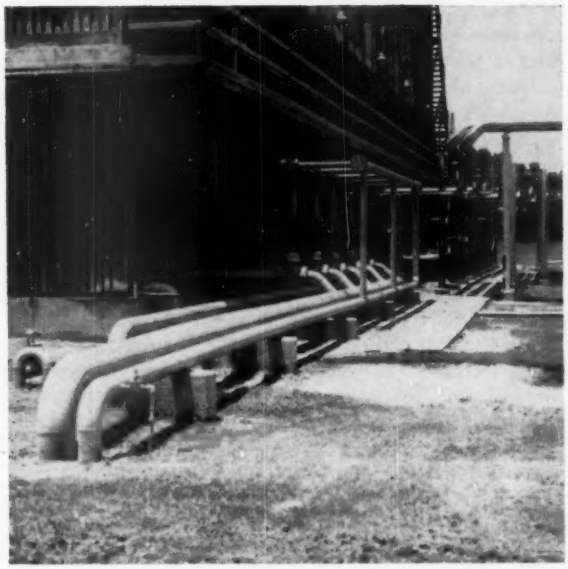
South Texas often encounters sudden changes in atmospheric temperatures of as much as 40 deg within an hour or two. And in the summer it is commonplace for the hot piping to be pelted suddenly by a hard cold rain. All these factors demand exceptional adhesive strength in a coating.

We have found a few places in which the coating may have encountered mechanical damage, or where the original surface preparation may not have been as complete as it should have been. In these places a small crack appeared in the coating, permitting moisture penetration and corrosion. When we found one, we would cut away the rust with a small sandblast tool and apply the epoxy over the cleaned area. The new coating bonds readily to the steel and the old coating for a sound moisture-tight repair. This ended corrosive attack in the area.

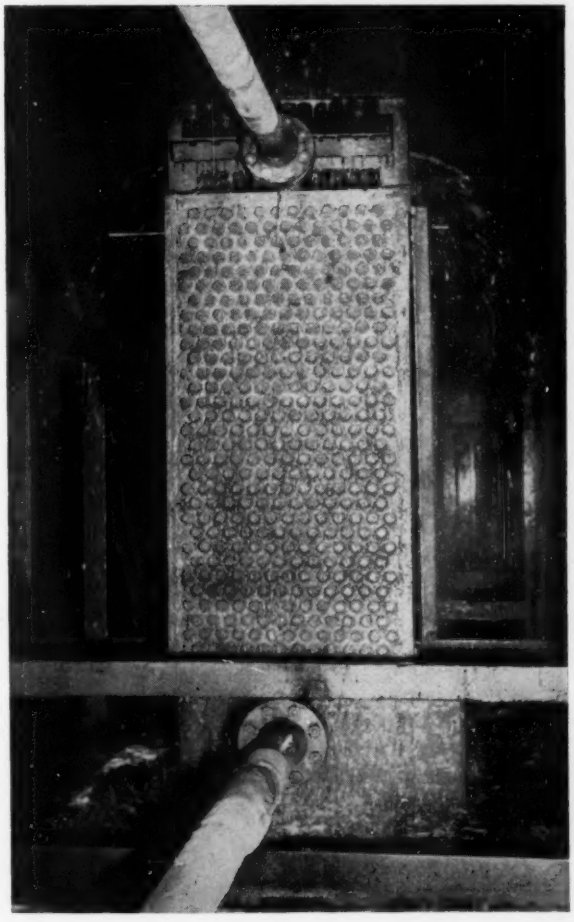
• How the steel was coated

Plasite is a two-part formulation of resin and curing agent. The two parts are mixed together about half an hour before the application. This provides a little time for the reaction to begin throughout the mixture.

LEFT: Headers were coated with epoxy after installation to prevent unnecessary handling. Special attention must be paid to coating of bolt heads and flanges.



ABOVE LEFT: Piping within 40 ft of cooling tower is protected by epoxy coating. Conventional paints can't take this punishment. ABOVE RIGHT: Typical build-up of calcium scale, particularly heavy on piping subject to spray, splash, and mist. BELOW: Water of 6.2 to 6.5 pH cascades down on condensers for hydrocarbon gases. Coated units show no evidence of corrosion.



After mixing, pot life of the formulation is about 24 hours at a temperature of 80-90 deg F. At lower temperatures the pot life is longer, and if the formulation is kept under refrigeration it is extended to about 48 hours.

To assure a good strong bond, steel was sandblasted down to white metal. This removed scale, grease and foreign matter, and provided the proper tooth for the prime coat. In sandblasting, we attempted to get an anchor pattern of 3 mils, since Plasite tends to set-up rather quickly due to its high solids content, and the rougher the steel the better the bond.

Coating was done with conventional spray equipment. A priming coat of green Plasite was applied in a light bonding pass to a thickness of 1.0-1.5 mils. This coat was followed immediately by a second and heavier coat of about 5 mils. After a wait of 24 hours, a finishing light gray coat of about 5 mils was applied. The coating was cured at atmospheric temperatures for seven days before the installation was placed in operation. When applying a high solids coating material, certain surfaces require special attention. In coating around bolt heads and nuts, and rivet heads, flanges and angle irons, there is a tendency for pinholes to appear. This defect leads to corrosion. This can be avoided by brushing in a good wet coat in these areas after surface preparation and following it with a heavy wet spray coat.

It is generally agreed that cooling tower service is as severe as any that a coating can be expected to stand up under. The six years' protection against corrosion provided by the epoxy resin coating has exceeded our fondest expectations. There is as yet no indication of failure of the coating. In the meantime, our cooling tower maintenance problems have been eased considerably. ■

Fluidized bed coating process starts with preheating valve to 500 deg F. Valve is then dipped into fluidized bed of finely divided Penton powder, following which it is baked to final state at 450 deg F.

When will plastic coated valves solve corrosion problems?

By PAUL A. MANOR, Chief Engineer
Central Valve & Research Department
Rockwell Manufacturing Co., Pittsburgh

Porosity in coating, which can't be allowed, is checked with a static voltage test. A current reading from probing electrode means a pinhole in the coating and a rejection.

VALVES, basic parts of any gas system, occupy a prominent place in a gas engineer's thinking. One of the most difficult problems is striking the right balance between original cost and wear life. If he specifies too high a quality for the requirements, he is wasting money. If he specifies quality inferior to the needs he is not only again wasting money, because of resultant replacement costs, but is also going to have a lot of maintenance problems.

In valving, corrosion is always the watchword. The usual method of combating this problem—specifying special construction materials to cope with the special problems of the gas being run—increases costs considerably and still doesn't always insure long valve life. Plating the valve with various corrosion-resistant materials is somewhat cheaper in many cases, but still has most of the objections of the straight metal changeover.

A related technique is the use of a plastic coating. Many plastics have unusual chemical inertness and are therefore excellent protectants against corrosion. In addition, these plastic-coated valves are considerably cheaper than bronze, stainless steel or plated valves.

• Coating characteristics

We have been looking into the possibilities and problems of plastic coating valves for some time, and find that a number of characteristics must be considered in picking a plastic coating material.

The most important are:

1. Easy application—This is more of a problem with valves than with process equipment generally. A valve is a very irregularly shaped object and if a coating does not cover every spot of the valve's surface evenly, it will fail. Yet this must be accomplished inexpensively, or the economic advantage over special metal valves will be lost.

2. Wide range of applications—The market for the coated valve has to be large enough to allow manufacturing economies. One of the major problems here has been the limited temperature range of most plastics.

3. Long service life—Clearly low initial price does not offer an economy if the valves must be frequently replaced. In order that a valve coating might have a long life it must have good surface adhesion, abrasion resistance, resilient structure, and resistance to cyclic wear.

Finding the plastic which meets all of these requirements can be something of a job. Some fit the corrosion requirements but were not physically strong enough. Some fit practically all service requirements, but are too difficult or costly to apply to the metal.

One of the first materials tried was the phenolic group. They are simple to apply—they're sprayed on—and have fair chemical resistance and wear characteristics. Unfortunately, however, phenolic is brittle and the coating breaks too easily in routine plant handling.

Epoxies and modified epoxies were tried next. They show considerable improvement on the brittleness problem, are also spray-applied, but slip downhill again on the wear problem in cyclic valve operations.

Polyvinylchloride shows good chemical resistance,

can be applied by the fluidized bed process, but has only a 140 deg F temperature tolerance and less than satisfactory wear resistance.

The polyfluorohydrocarbon plastics show the most promising chemical and physical resistances, but it has been virtually impossible to get an adequate coating thickness and still keep the cost in line.

• Penton tests

The most successful answer to the problem of low-cost corrosion resistance has proved to be the use of chlorinated polyether of high molecular weight, linear in nature and crystalline in character, called Penton. When we first heard about Penton we felt that this was the sort of material we were looking for and subjected it to many tests. We tested its specific gravity, tensile strength, tensile modulus and elongation at 73 deg F and 212 deg F; flexural strength, flexural modulus, and Rockwell hardness at 73 deg F; Izod impact, notched and unnotched at 73 deg F, —20 deg C and —40 deg C; water absorption; deformation under load at 122 deg F and 2000 psi; compressive stress at 1 per cent offset; compression modulus, heat distortion, flammability; thermal coefficient of linear expansion; and accelerated exposure.

To determine the corrosion resistance of coated parts, steel coupons were coated with approximately .015 in. thickness of Penton and immersed in various groups of chemicals for 90 days over a temperature range of 70 to 200 deg F. Using the results of these tests we came up with a rating system for representative chemicals as follows:

a—Resistant up to 200 deg F; for high temperatures confirmation tests under duplicate conditions should be run;

b—Resistant to corrosion up to 80 deg F; confirmation tests required for higher temperatures (in some cases plastic discoloration and weight change may occur, but this is not necessarily indicative of lack of serviceability);

c—Additional information regarding operating conditions required;

d—Not recommended.

Field tests with coupons followed up the laboratory work to make sure that the original tests were accurate and to give potential users a chance to evaluate the coating in their own special environments. About 1100 coupons were placed with chemical, petrochemical and oil refining companies around the country.

• A successful coating

The results of these tests showed us that we had a usable coating which gave a comparatively low cost valve with resistance to a wide range of corrosive substances. This had been expected from what we knew in advance about Penton. What made the Penton-coated valve a commercial reality, however, was a new, relatively simple, and quick coating process which produced a uniform adherent and void-free coating. This is the Whirlclad process, an adaptation of the fluidized bed method of coating.

Since it is important that there be no pinholes in the coating—which would cause undercutting—each valve part is checked with a static voltage test wherein current reading would indicate an imperfect coating which permitted the electrical circuit to close.

Larger Penton-coated lubricated plug valve in heavy-duty chemical installation.

We have, since starting this program, accumulated a great deal of information regarding the performance of Penton-coated valves. As of September 1959, approximately 1200 of these valves have been in operation in process plants for up to three years.

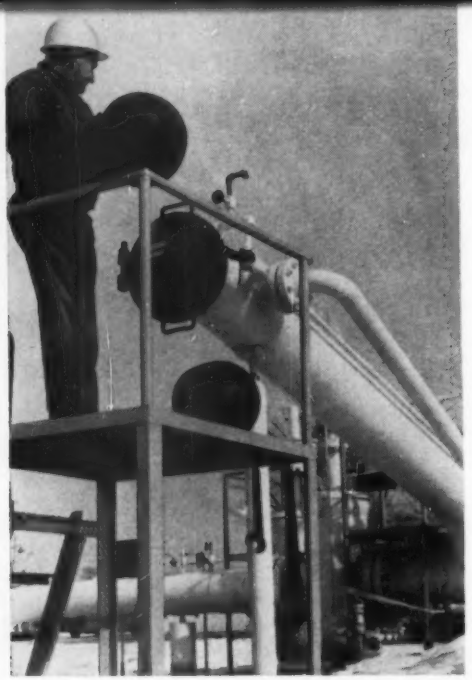
• Mechanical damage

Of all the plastic coated valves we have shipped out, approximately 1 per cent have been returned because of some sort of failure; the rest lived up fully to expectations. The causes of the failures were, more often than not, mechanical rather than chemical. The chemical failures were due to incorrect application and were predictable. Line fluids such as hot chlorinated solvents are absorbed by the plastic, causing it to swell. Some of the early failures resulted from pinholes which weren't caught by an earlier inspection routine.

Most of the failures resulted from a physical damage to the coating caused by either abrasive material in the line fluid, use of the valve for throttling, or a combination of both. For example, in one installation the line fluid was a mixture of chemicals highly corrosive to carbon-steel pipes. The pipe corrosion created a fine abrasive powder which was carried by the line fluid into the valve (frequently operated), where it abraded away sufficient coating to eliminate virtually all protection.

A number of cases of failure resulted from using the valve for throttling. This reduces the area of flow for the line fluid, thus increasing the flow velocity at the plug port and valve body throat edges. At the same time the laminar flow pattern is interrupted, causing cavitation. This combination introduces a damaging erosion factor—causing the coating to become loosened by corrosion of the base metal, rather than by actual attack of the line fluid on the plastic.

Our three-year evaluation of Penton-coated lubricated plug valves shows, therefore, that the coating provides a relatively broad spectrum of corrosion protection. The coating also wears well if it is not used in throttling service or where there are abrasive materials in the line fluid. Because it is also not too difficult or costly to apply, we have found it a comparatively low-cost solution to a wide variety of valve corrosion problems. ■



Originally designed as product separators, versatile neoprene balls also serve to remove liquids, clean lines, prove meters, hydrostatically test piping.

Pipeline spheres have multiple uses

HOLLOW, liquid-filled neoprene spheres have recently taken over many of the jobs previously handled by conventional pipeline pigs. Preinflated slightly larger in diameter than the pipe, they are propelled through either gas- or liquid-filled lines under the pressure of product flow.

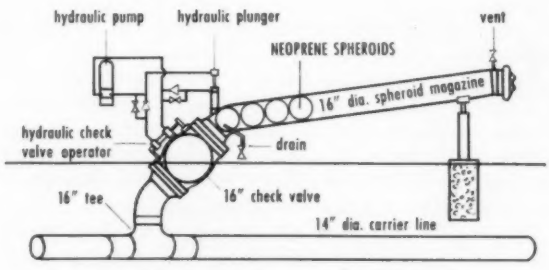
Due to their spherical shape, these compact new units wear evenly as they slide through the line and maintain piston-like contact with the pipewalls to sweep gases, liquids, or suspended solids ahead of them. It is almost impossible to block them in the line. They will deform and squeeze past immovable obstructions, even extrude melon-shaped through valves several inches smaller in diameter. Perhaps the biggest advantage of the pipeline spheres is that they can be run with equal effectiveness in either direction. Additionally, the neoprene spheroids require a relatively small amount of fluid energy to propel them.

Wearing quality of the spheres depends on the type of service but ranges from twice to several times the life of conventional squeegees or scrapers. In gas lines this means up to 600 miles and in liquid-filled lines up to 3000-4000 miles of service life. Such performance is an excellent testimonial to neoprene's abrasion, oil, and chemical resistance. The only maintenance required is occasional resizing to compensate for wear. This is accomplished at receiving stations by additional inflation. Field equipment for pumping up the spheres is provided by the manufacturer.

Before their introduction to the general pipeline industry in the spring of 1958 the neoprene spheres had been a five-year long joint development project between the rubber manufacturer and the Shell Oil Co. During this long testing period it was recognized that the spheres could be effectively used for more than their original purpose of reducing interfacial mixtures in a products line. Launching, bypass, and recovery equipment was specially designed to facilitate the use of spheres in a multiplicity of pipeline setups.

According to M. L. Barrett Jr., Senior Engineer, Shell Oil Company, in a paper presented at the ASME Petroleum Mechanical Engineering Conference, Houston, September, 1959, the full potential of pipeline spheres is only beginning to be realized. Quoting from his paper: "Pipeliners, who have a reputation for a fertile imagination, are using the balls for filling test sections, purging lines following construction, removing liquids from offshore gas gathering systems, cleaning pipelines with a solvent wash (run back and forth between two or more spheres), liquid meter proving by the 'measured mile,' the 'endless mile' or 'portable bidirectional' methods and radioactive tracer flow studies. There are many others (examples) which might be discussed; even for instance, the experiments in which the spheroid has been used as a means of internally coating a pipeline, as a blowout preventer, as a surge suppressor and pulsation dampener, as a check valve at a gas compressor station and as a means of locating underground piping with a radioactive source in the sphere and a scintillation detector."

These many applications have, to date, utilized neoprene spheres ranging from 36-in. diameter giants that require mechanical handling down to golf ball size, 1½-in. diameter units. Below 4-in. diameter all balls are solid. And for all sizes the standard compound is neoprene. ■



Schematic of check valve-type spheroid launcher.

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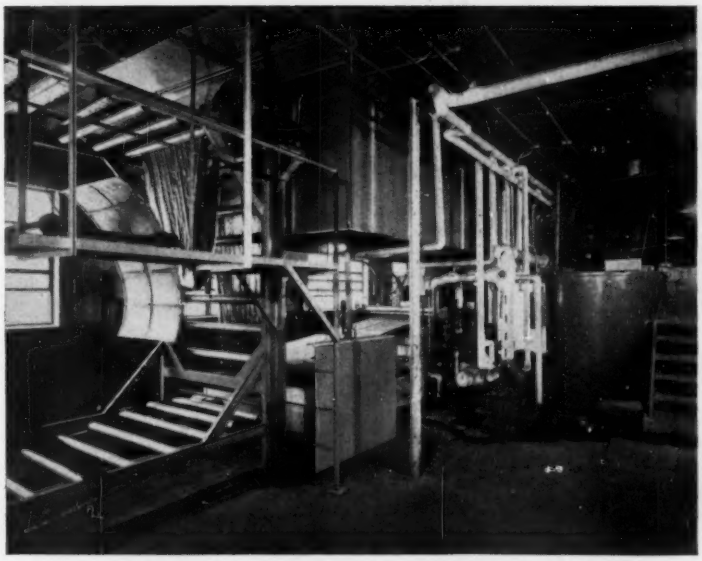

View of specially-designed machine developed after five years of research by Tapecoat engineers to convert raw materials automatically into TAPECOAT 20.

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Bethlehem makes it—electric resistance-weld line pipe from $5\frac{9}{16}$ to 16 in. OD in lengths to 62 ft. Our modern pipe mills at Sparrows Point, Md., are regularly turning out these longer lengths for installation all around the country. Pipeliners like 'em, since they mean fewer welds in the field.

Bethlehem line pipe speeds up line construction in other ways, too. It's good, sound pipe, tested and re-tested at the mill to make sure it will test out OK in the line. Every length is straight as a stretched string, round in the body, and square and accurately beveled on the ends. It's pipe that will line up fast and take a good weld every time.

When you need l-o-n-g lengths of top-quality line pipe, call on Bethlehem. We have a sales office near you.

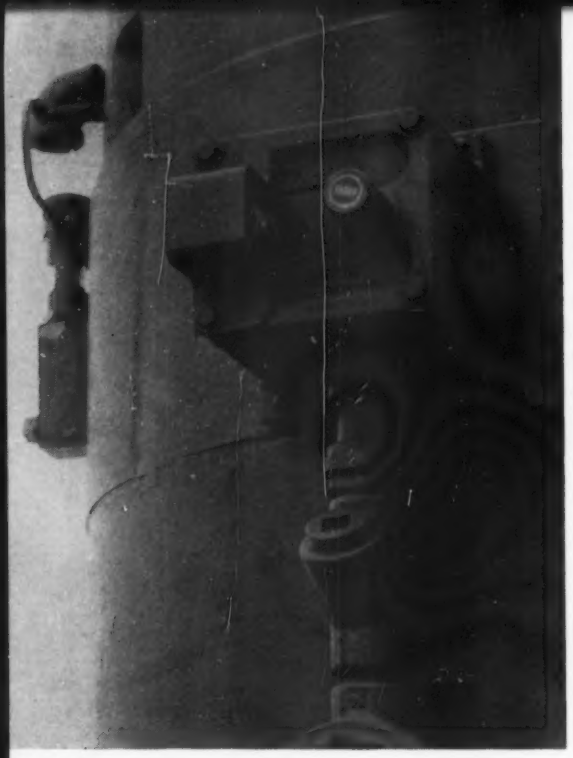
Steel

for Strength
... Economy
... Versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



Close-up of a Vibraswitch mounted directly on a 4500-rpm motor with conduit leading to a central control panel and to automatic shut-down equipment. When a malfunction causes a shut-down, a control room indicator is simultaneously triggered.

Vibration detection device proves itself in three-year test

AN experiment in preventive maintenance has paid off in substantial operating cost savings at Warren Petroleum Co.'s Mont Belvieu (Texas) L.P. gas production plant.

Built three years ago, the plant is among the most advanced units producing and storing propane, butane, and related products. Designed for around-the-clock operation with minimum personnel, it needed fully automated devices for monitoring and control. Consequently, a search was instituted for a dependable mechanical equipment-monitoring device.

Thirty machine areas were pinpointed as potential maintenance problems. These are vital fans, pumps, blowers, and driving motors—devices prone to assorted malfunctions in normal use, and to an even greater assortment when in continuous use.

Bearing failure, for example, is quite common when motors run continuously for long periods. As the bearings heat up, end-play frequently develops around rotating shafts. This condition, if allowed to continue for long, increases the probability of drive shaft warpage or breakage.

Fans and blowers, especially high speed models, are also prone to metal fatigue. Blades and vanes, including those on turbines, often weaken at their roots and pull free, causing damage to the unit and to equipment in the vicinity.

Lubrication equipment failures are another source of malfunction in continuously operating, non-attended equipment. Lack—or a surplus—of adequate lubrication soon results in expensive shut-downtime and repair.

After reviewing many devices, Warren engineers chose Robertshaw Model 65 Vibraswitch malfunction detectors. Tests indicated that this unit is able to detect shaft motion from overheating bearings and high frequency vibrations from the slightest out-of-balance condition caused by metal fatigue at vane or blade roots. In addition, the sensitivity of the device enables early detection of lubrication defects, usually prior to any damage.

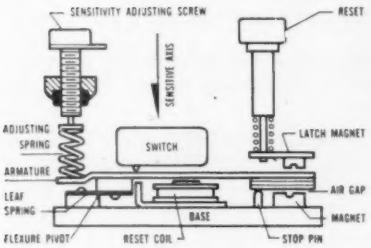
The Vibraswitch is essentially a passive device, consuming no power and doing no work until actuated. Because it is passive, it does not wear out while waiting. Actually, it is a vibration-actuated relay in which the mass/length of the armature, as influenced by an adjustable armature loading spring, determines the point of actuation.

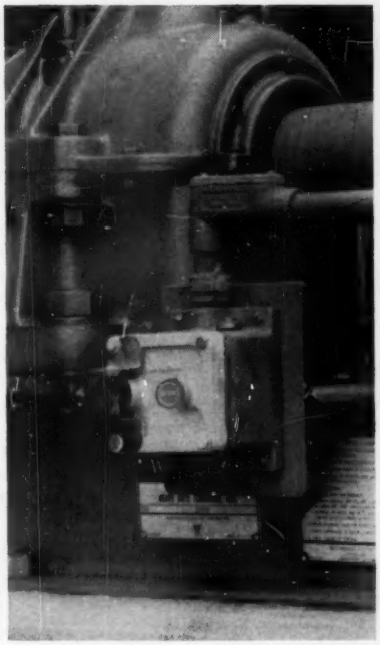
When the velocity, amplitude, or acceleration rate of vibration of the protected unit exceeds a predetermined amount, the armature overcomes the counteracting force of the spring. The magnet that has held the armature now lets it move to the tripped position, operating a snap-action electrical switch. This switch can be connected to a variety of circuits, including alarm, shut-down, by-pass, and corrective. A number of units may be protected by the same shut-down or alarm circuit, parallel circuits being used with indicators pointing out which switch was tripped.

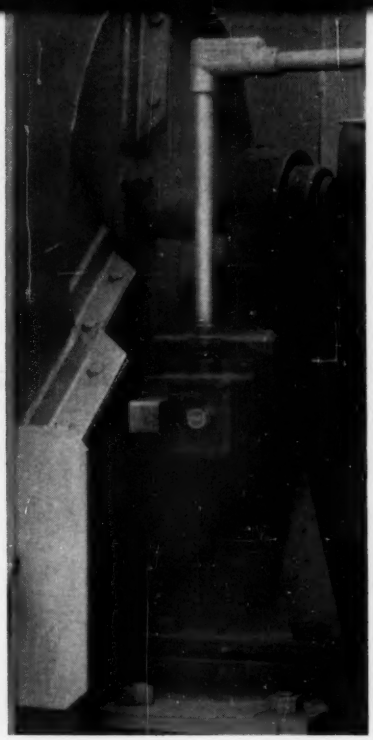
The device can be reset manually by pushing a button on the outside of the case, forcing the armature away from the tripped holding magnet and back against the resting stud near the untripped holding magnet. It can also be reset by an electrical reset coil which attracts the armature from the tripped magnet toward the untripped magnet. This coil can also hold the armature in the untripped position during high vibration start-up periods.

RIGHT: This Vibraswitch is on a mounting plate welded to the base of the dual-circulating liquid-cooled bearing journals and drive shaft between a high-capacity turbo-vane fan and its drive motor.

FAR RIGHT: This Vibraswitch is mounted on a heavy angle plate welded to the bearing pedestal between a 1750-rpm motor and a forced air blower. It can detect malfunctions in any part of the drive train, including bearing, motor, or fan blade.







According to Warren engineers, the Vibraswitch has far greater dependability than manual observations or less specialized equipment. They say malfunction detectors which depend on physical shaft displacement or actual displacement vibration are unable to spot the beginnings of most failures and thus allow the failure to occur.

But before every malfunction, there is some warning. In the case of bearing collapse, this may be a short period of high frequency vibration at very low amplitude. Because this warning vibration is of higher-than-normal frequency, the sensitivity of Vibraswitch to increases in velocity and acceleration of vibration will cause actuation. This sensitivity is due to the construction of the armature support, a leaf spring bound in shear flexure, and to the manner in which the armature is constrained in untripped condition, one end damped in a magnetic field because it is closer to one of the two magnets.

This malfunction detector may be mounted in a variety of locations, depending upon the plane and the amount of vibration to be monitored, as well as the physical position of the protected unit. Generally, it is positioned vertically on the protected unit to monitor horizontal vibration. It can, however, be mounted in any orientation for detection of vibration in any plane. Location is determined by the sensitivity adjustment range of the Vibraswitch. If vibration is too great for this range when the unit is mounted in the usual location (on a bearing end-cap, pillow block, shaft support, rotor housing, etc.), it may be placed at a greater distance from the vibrating parts, even on the base of the protected unit.

Vibraswitch will normally accommodate vibrations up to 2.0 g (maximum). However, a special model with reduced sensitivity will tolerate up to 4.5 g (maximum) acceleration.

Once mounted, a Vibraswitch is quickly readied for operation. First, it is adjusted to the point where it trips while the protected unit is *not* running. Then, it is adjusted to determine the point at which it will trip when the unit *is* running. The adjusting knob is then set to the number half as high above the running setting as the running setting is above the non-running setting. This provides a 50 per cent cushion in which the protected device may run without tripping the protector.

Because the Warren installation is remote and automated, the Vibraswitches were wired to shut down many of the protected units. On units requiring complicated shutdowns, the device was connected to an alarm system which alerts personnel to actuate shut-down procedures or other corrective steps. Some units in key areas both sound alarms and actuate shut-down procedures. In other cases, a delay is desirable between detection of excessive vibration and activation of alarm or shut-down procedures. For such applications, a monitor time delay was built into the Vibraswitch. Thus, a pressure pocket causing short-period vibrations on a pump motor would not trip the malfunction detector.

Because this device is entirely mechanical and no vacuum tubes are used in associated control box circuitry, no one need even periodically check either the protected equipment or its protector, the Vibraswitch. Thus, greater freedom and economy have been provided in still another phase of remote or fully automated installation design. ■

Automatic... continuous

15-second figuring gives total corrected flow in Bridgeport

Bristol telemetering computer system helps gas dispatcher operate near contract limit yet avoid penalty charges.

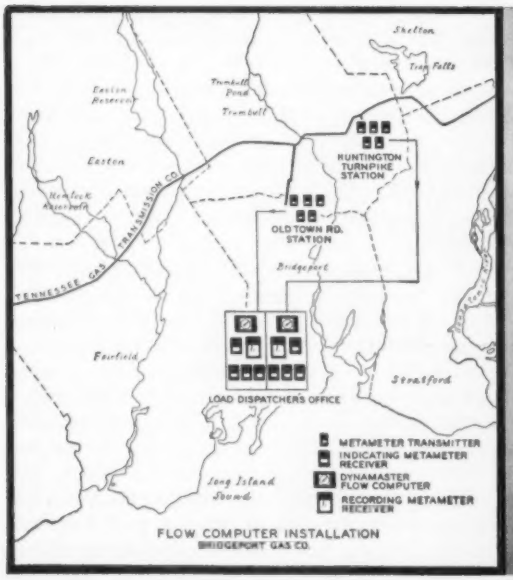
Bridgeport Gas Company, Bridgeport, Connecticut, operates in a heavily populated, heavily industrialized area. Toward the end of a peak-load period, penalty charges for exceeding the contract limit on purchased natural gas might easily amount to a substantial sum of money—even in the ten minutes it would take to compute manually the total corrected flow from their two city gates (see map), each of which is under separate contract.

But, Bridgeport Gas has found a way to ease this problem: Their Bristol telemetering computer automatically and continuously totalizes and corrects gas flow to within the last 15 seconds of consumption. The corrected flow is presented—along with other information—in the central dispatcher's office so that he can instantly take remedial action, drawing upon "peak shaving" storage and LPG facilities, if an over-run condition appears likely to develop.

It's been estimated that savings from one ten-minute over-run, prevented in this manner could more than pay for the cost of the entire Bristol computer set-up.

This is typical of the outstanding jobs Bristol telemetering is performing today for gas pipelines and distribution companies, oil pipelines, electrical transmission networks, water plants, and industrial plants. Pressure, liquid level, flow (including total corrected flow), temperature, mechanical motion, voltage, current, and electric power are just a few of the variables that can be transmitted. Distances may vary from a few yards to hundreds of miles. Almost any transmission medium may be used: telephone lines, carrier current, and radio—microwave, VHF and UHF.

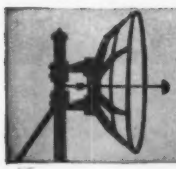
Let us send you more data on Bristol telemetering. And, of course, thoroughly experienced Bristol applications engineers are always ready to talk over your specific problems with you. Write: The Bristol Company, 119 Bristol Road, Waterbury 20, Conn. 0.28



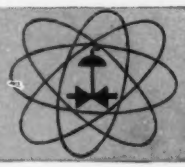
This Bristol Telemetering Computer Panel gives Bridgeport Gas Company dispatcher complete data *in seconds* on pressure, temperature, and corrected totalized flow of purchased natural gas. Flow-computing Dynamaster* instruments for each station (see map) are at top of panel; integrating counters are directly below them. **T.M. Reg. U.S. Pat. Off.*

BRISTOL... for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



Communications and Automation



Edited by FRANK CHAPMAN

New computer performs more control functions

A new analog computer that performs any one of the three mathematical functions most common to process control has been introduced by the Swartout division, Crane Co.

A typical application is the computation and control of the mass flow of gas. Here, the computer would be used to multiply and/or divide differential pressure by temperature and pressure.

The new computer can extract the square root of a single input or ratio or multiply two inputs from any Autronic primary transmitter. Its output signal is the accurate analog value for the given mathematical function, and can be used to directly operate any Autronic recorder, indicator, or controller.

Called the C4A/2, the new computer permits electronic instrumentation to be used for many control functions that formerly required pneumatic systems.

Linear flow can be computed and controlled by using it to extract the square root of the signal from a differential-pressure transmitter measuring the pressure drop across an orifice plate.

In pumping stations, the computer can be the basis of a system that controls compressor horsepower according to simple computations made by multiplying pressure by flow.

Fuel-air ratios can be obtained by using the computer to divide the appropriate flow values, and flow blending systems of all types can be designed around the computer's ability to ratio two streams.

Physically, Swartout's new system consists of a single case containing three major components: a high-grain, linear feedback amplifier; a rotary solenoid that proportionally drives two differential-transformer cores; and a servo-amplifier to drive the solenoid. A selector switch controls the function the computer is to perform.

Designed for back-of-panel mounting, the unit's input and output signals are within the standard Autronic range of 0 to 0.5 v a.c. The unit operates on regular 115-v power, and is fused protected.

Electronics research division formed

Collins Radio Co. is setting up a corporate research division to advance basic research in electronics. President A. A. Collins said the new division probably will be located in La Jolla or Newport Beach, Calif., where the University of California is also developing new facilities.

Among fields the division will work in are solid state physics, electromagnetic wave propagation, thermoelectric phenomena, information theory, network synthesis, radio astronomy, and digital processing.

Directing the new division will be Dr. R. L. McCreary, presently director of research at Collins' Cedar Rapids (Iowa) division.

Collins' Texas division has introduced a new transistorized dc converter—the 526Z-1—for use in its microwave systems. It supplies 130-v dc plate voltage from an input of either 24 or 48 v dc. The 526Z-1 uses four power transistors in a bridge circuit in conjunction with a saturable transformer as a square wave switching oscillator. The stepped-up square wave is rectified by a silicon diode bridge with a filtered output.

DC operation adds an extra margin of system reliability by protecting against outages from primary power failure, and, in Collins systems, by eliminating rotating inverters. DC operation also tends to reduce the amount of noise introduced in the system. Savings may be realized with the 526-Z1 in power drain, maintenance, and eliminating standby generators.

The company offers systems operating from several power options —24 v dc only; 24 and 130 v dc; 48 v dc only; or 48 and 130 v dc—enabling selection of the best combination to integrate with existing battery plants.

New optical scanning device announced

New among optical scanning devices for data processing systems is the tabulating card punch announced by Remington Rand Univac division.

The optical scanning punch is designed to read handwritten markings on a standard 90-column tabulating card and punch the appropriate code holes into the same card. It does this work at a speed of 150 cards per minute. It does not require the use of a special magnetic pencil—any soft lead pencil will do—and no special symbols are needed. It reads actual numerals as well as normal pencilled notations such as check marks, lines, X-marks, and circles.

By eliminating the need for manual card punching from original source documents, the optical scanning punch drastically reduces the most time-consuming phase of punched-card data processing and automatically detects improperly marked cards.

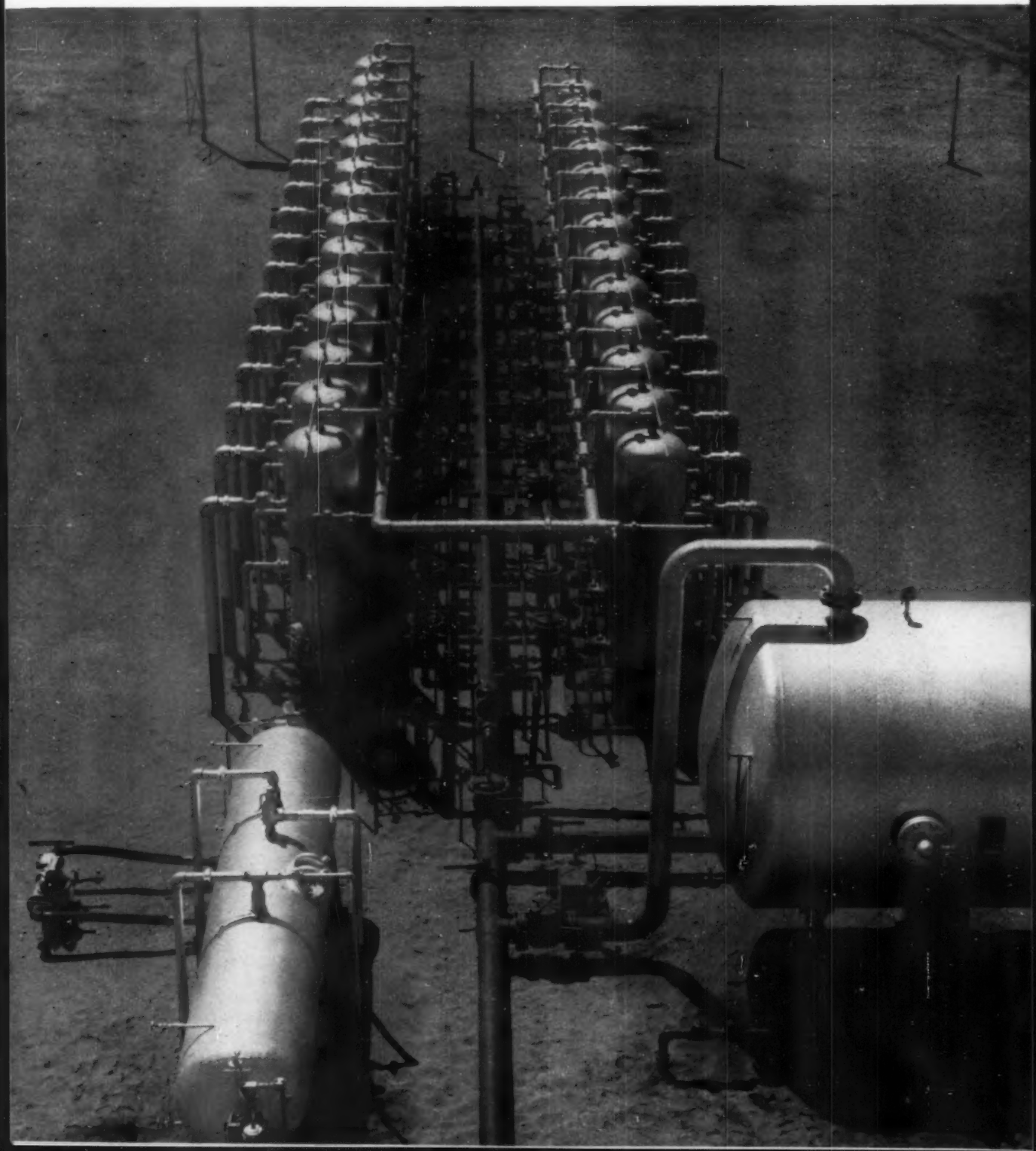
Brochure describes two-way radio

Motorola's new, extensively transistorized Motrac two-way radio line is described in a new brochure.

The booklet contains complete explanations and illustrations of the benefits possible through the incorporation of transistors in the new unit. Among advantages described are low current drain, compactness, reduced maintenance, and high audio power.

A special section is devoted to research and engineering.

automatic – economical
it's Foxboro Gas-Oil



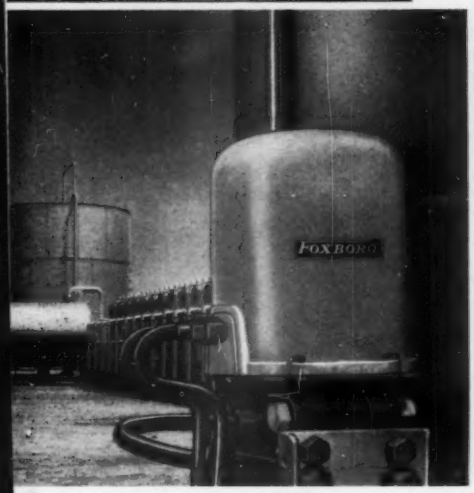
– maintenance-free...
Separator Control

Three simple, low-maintenance Foxboro instruments — that's all you need in Foxboro's automatic oil-gas separator control system.

1. The Foxboro d/p cell* controller to regulate tank level and, where desired, provide automatic emergency shut-off of incoming production
2. The Foxboro M/41A Controller to maintain constant, even back-pressure in the separator
3. The Foxboro T/37 Diaphragm Meter for accurate indicating measurement of gas flow leaving the separator

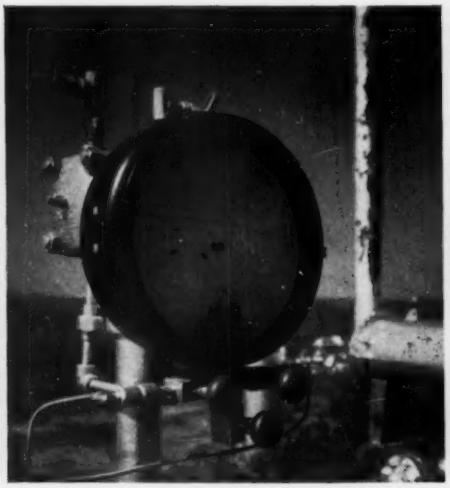
Three, simple, low-cost, low-maintenance instruments to control the whole separation process — economically, automatically.

Ideal for a single separator, or for a whole battery of them. Ask your nearby Foxboro Field Engineer for details. Or write for Bulletin 1-28. The Foxboro Company, 3411 Norfolk Street, Foxboro, Massachusetts.



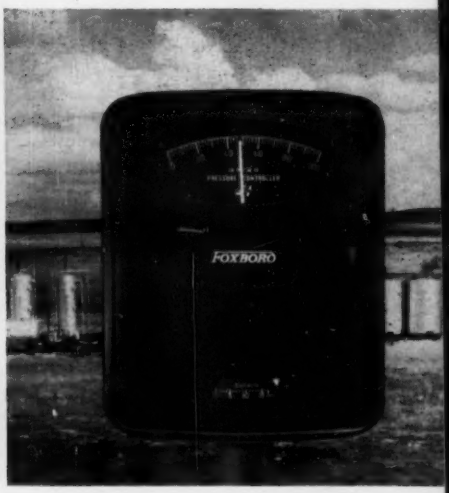
For Oil Level Control...

d/p cell measures change in separator level and operates Foxboro control valve in oil draw-off line. When valve is equipped with Foxboro Valvactor* positioner oil in separator can be controlled through any desired range of level.



For Gas Flow Measurement...

the Foxboro T/37 Diaphragm Meter. Keeps accurate chart record of gas flow leaving separator. Meter uses no mercury — cannot be damaged by overrange. Simple, rugged, responsive — it seldom requires maintenance of any type.



For Back-Pressure Control...

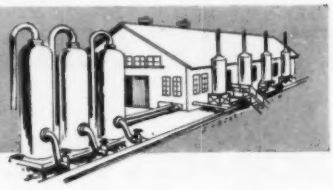
the Foxboro M/41A indicating controller. Maintains close control of pressure in separator by operating Foxboro Stabilflo* control valve in output line. Smooth, even gas flow is assured. Separator back-pressure may be easily preset from index pointer on controller.

Reg. U. S. Pat. Off.

FOXBORO

REG. U. S. PAT. OFF.

GAS PIPELINE NEWS



Kuykendall comments on Phillips decision at INGAA convention

TWO of the best known chairmen in the federal government were the top speakers at the early-October Miami Beach convention of the Independent Natural Gas Association of America.

This time, the chairman of the Federal Power Commission, Jerome H. Kuykendall, had much the better of the situation. It will be recalled that when the two recently shared an audience — during the Congressional probe of the FPC— the chairman of the House Interstate and Foreign Commerce Committee, Rep. Oren Harris, rated the center spotlight.

Now, because his commission had just rendered the historic Phillips decision, Kuykendall rated the mid-October headlines. And he got them. One newspaper clipping service had him ahead of Harris on a four-to-one basis. Among the headlines were: "FPC Chairman Criticizes Gas Producers," Better Days Ahead for Gas — Kuykendall," "Kuykendall Says Prices Set for Gas-Producing Areas Are Temporary," and "FPC Head Sees Long Court Test."

Kuykendall's comments on the historic decision included:

A criticism of gas producers for "relatively minor contentions." Consumers, he said, should have "adequate natural gas at fair prices," but "this cannot be done if the governmental agency is forever to wallow in a morass of technicalities, relatively minor contentions, and objections and litigation in the courts."

A hope that "better days lie ahead" for the relationship between the FPC and the natural gas industry. "It is my expectation and sincere hope that these documents open the door to a new era in the natural gas industry, an era that will be characterized by sensible procedures and sound economic standards for fixing just and reasonable rates."

A clarification that the area prices are neither fixed nor firm, but are only temporary guides until hearings can determine a reasonable price for each area. "Through these hearings, we will attempt to determine prices which will best stimulate the industry in that area to a level of development which will provide the required supplies of natural gas, but we will set prices no higher than necessary to achieve that end."

An estimate that there will be a two-year court fight "fraught with uncertainty and confusion" before the final Supreme Court decision on both Phillips and area pricing. "No one knows whether the decision of the Supreme Court will leave a permanent and sensible basis for regulating the producers' prices or will reinstate the chaos which now exists . . . Although I am confident that the opinion we have issued is legally sound, it is possible that the Supreme Court may hold otherwise."

An estimate that the decision "will have virtually little effect" on the current backlog of cases, "so far as cutting back on case load numerically," but "will probably expedite their settlement."

In comparison, Rep. Harris said he had not studied the Phillips decision enough to know whether it could be the basis for legislation in the next session. But he did promise to press for a bill that would stop off-the-record contacts between industry figures and members of regulatory commissions.

Among the most noteworthy of the other speakers was David T. Searls, vice president and general counsel of Gulf Oil Corp., who called for "a tremendous increase" in natural gas exploration and drilling. He said the current rate of 44,000 wells drilled per year must be stepped up to 62,500 wells, if the needs of the next ten years are to be met. The additional costs must be absorbed by higher gas prices, Searls said. He suggested that a committee of natural gas industry and regulatory agency representatives be formed to estimate the increase in demand for the next ten years and the increase in expenditures needed to meet the demand.

Included in the regular convention business was the election of new officers. W. E. Mueller, president of Colorado Interstate Gas Co., was elected president, succeeding Glen W. Clark, of Mississippi River Fuel Corp. W. M. Elmer, president of Texas Gas Transmission Corp., was named first vice president, and Orville S. Carpenter, president of Texas Eastern Transmission Corp., became second vice president.

"Enchilada Inch" clears third hurdle

THE "Enchilada Inch," that $225-million pipeline project expected to bring huge quantities of Texas and Mexican gas into Southern California via northern Mexico, cleared another hurdle in mid-October. This was the signing of a 20-year contract calling for delivery of a major portion of the gas.

Under the terms of the agreement, Humble Oil & Refining Co. would sell to Southern California Edison Co. a total of approximately 1.8 trillion cu. ft. from various fields in south Texas. Deliveries would start at about 108 MMcfd during the first year and rise to a maximum of 265 MMcfd beginning with the fifth year.

Previous obstacles cleared were a June 8th agreement between Tennessee Gas Transmission Co. and Petroleos Mexicanos and a Sept. 15th agreement between TGT and Edison. The first called for purchase of a portion of the gas supply from Pemex (the government oil agency of Mexico) and for construction and operation of the $165-million Mexican portion of the line. The second provided for delivery of up 455 MMcfd to Edison.

While this gas would be used for generating electricity, the Mexican gas portion could be made available for peak period residential needs in Los Angeles.

Mississippi's gas goes to utilities

Virtually all of Mississippi River Fuel Corp.'s pipeline capacity has been allocated to its utility customers by an FPC presiding examiner (Dockets G-17567 et al). (See October GAS, p. 127.)

MRF was told to increase the stated demands of its utility customers in two steps. Its 16 customers' total stated demands are now 466.8 MMcfd. The demands will be raised to 499 MMcfd as of the present effective date and to 531.4 MMcfd on Dec. 1, 1961.

Presiding Examiner Francis L. Hall said that Mississippi's performance as a pipeline supplier should not become static. It must constantly evolve in step with the advancements and requirements of the area it serves.

He said that MRF's customers, without any apparent support from Mississippi's industrial customers, have diligently sought new supplies from MRF. They wanted the new supplies to come through system expansion rather than through creation of a new subsidiary to own and operate a separate system. Hall said Laclede Gas Co. and Illinois Power Co. properly rejected Mississippi's proposal of a "new subsidiary or nothing." He said that "an expanded system with a rolled-in rate, rather than a separate system, serves the salutary function of equal treatment for all."

Laclede, by far Mississippi's largest customer, has failed to obtain the additional gas to which it believes it has been entitled, Hall said. Laclede has been in need of a substantial increase in gas supply to meet the unsatisfied and constantly increasing demands of its service area. The examiner said that the failure is due to Mississippi's interest in protecting and promoting its profitable industrial sales.

In addition, Mississippi was charged with lacking incentive to provide utility customers with their needs in a manner compatible with the overall public interest. Although all of MRF's industrial contracts are interruptible, MRF regards some of the industrials as firm customers, the examiner said.

Hall also said that the pipeline's exceedingly high overrun penalty effectively prevents its customers from obtaining excess gas available from time to time. He found the overrun provision inequitable and discriminatory and ordered Mississippi to revise its tariff to remove the objectional features and to substitute lower overrun penalties.

The examiner also agreed with Laclede's position that if Mississippi is unable or unwilling to meet its requirements, it would be permitted to buy its additional needs from other suppliers without endangering its position as a purchaser from Mississippi.

Mississippi was also charged with increasing its system capacity by 74 MMcfd and attaching additional industrial users without FPC authorization. The company was told to apply for certificates covering the unauthorized expansions and sales. Mississippi's contention that FPC lacked authority to regulate its industrial service was rejected.

PLC, Southern Union hunt for gas

Pacific Lighting Corp.'s new subsidiary will develop natural gas reserves—principally in the Southwest and the Rocky Mountains—for future use in southern California.

The new company, Pacific Natural Gas Exploration Co., will explore jointly with a new subsidiary of Southern Union Gas Co., Dallas.

PLC chairman Robert W. Miller said "The present project is limited in scope and experimental in nature and probably will provide only a small part of Pacific Lighting's future requirements for gas. It is a step, however, toward the objective of having available gas reserves for use in later years to supplement the gas to be bought from El Paso Natural Gas Co. and Transwestern Pipeline Co."

Southern Union Production Co. will supply the bulk of the manpower and technical services for the program. The California company will own about half of all gas developed and approximately a quarter of oil developed. It also will have preferential rights to buy any part of Southern Union's half of the gas production which will not be required by Southern Union Gas Co.

Southern Union president James C. Reid said his company will acquire blocks of acreage located within 100 miles of the interstate pipeline systems serving the southern California market. Reid noted that major portions of these systems are located within his company's distribution territories. Pacific, in turn, will provide funds for the drilling of a minimum of 10 exploratory tests per year on these blocks.

Reid indicated that a location has already been surveyed on a block of acreage in northeastern Utah for the first test well under the joint exploration program.

Proposes lateral to new gas reserves

Hearings got under way last month on Panhandle Eastern Pipe Line Co.'s plan to build a supply lateral in western Oklahoma and Kansas (Docket CP60-103).

The $15.7 million project consists of about 150 miles of 24-in. and 50-miles of 22-in. pipe. Panhandle will be able to gain access to more than 750 billion cu ft of proven gas reserves now committed to it. The reserves are located principally in the Elk City field and in the Arvard, West Chester, and Northeast Seiling fields.

Panhandle has contracted to buy an average daily volume of 125 MMcf from Elk City during the first year and 135 MMcfd during the two succeeding years. Moreover, upon six months' notice, the producers are obligated to increase deliveries to an average of 180 MMcfd and a maximum daily volume of 225 MMcf.

Pacific Lighting opposes Mexican line

As expected, Pacific Lighting Corp. is opposing the Mexican pipeline proposal of Tennessee Gas Transmission, Petroleos Mexicanos, and Southern California Edison Co.

F. M. Banks, president of Southern California Gas Co., said his company "would have to oppose it on behalf of the 8 million people we serve. It would not be in their best interests and would raise their gas rates. . . ."

As announced by Edison president J. K. Horton, contract for the $225 million project calls for delivery of up to 445 MMcfd from fields in south Texas and the northern part of Mexico.

The south Texas pipeline will run south to Reynosa in the state of Tamaulipus, Mexico. There it will connect with a new 1200-mile line across northern Mexico to the vicinity of Mexicali in Baja California, Mexico. New pipelines about 280 miles long would be built in California to deliver the gas from the California-Mexico border to Edison's steam-electric generating stations in the Los Angeles basin.

Pemex will own and operate the 1200-mile Mexican portion of the line. However, TGT will arrange for the gas supply, construction of the entire line (including that portion in Mexico), arrange for the financing of the Pemex line and setting up of a Mexican corporation to provide its maintenance and technical supervision.

TGT's "if, as, when" import plan denied

Tennessee Gas Transmission Co.'s plan to import 204 MMcfd from Canada has been turned down by an FPC presiding examiner (Dockets G-20388 et al).

TGT wanted to take the gas on an "as, if, and when available" basis from Trans-Canada Pipe Lines Ltd.

Examiner Harry W. Frazee said TGT ". . . failed to show . . . a market for the gas . . . to be imported, . . . it has also failed to show the proposed price to be paid . . . is in the public interest and is required by the present or future public convenience and necessity."

Tennessee also failed to present a gas purchase contract with Trans-Canada, Frazee said.

Panhandle gas goes to Michigan, temporarily

Late in September, Panhandle Eastern Pipe Line Co. was ordered to allocate 100 MMcfd from its system to Michigan Consolidated Gas Co. (Dockets G-10396 and 11061). The interim delivery was slated to end Oct. 31.

This on-again, off-again battle has been raging for several years. (For another phase, see Distribution News.)

In December 1958, FPC told Panhandle it could abandon the sale of 127 MMcfd to Michigan Consolidated. Mich Con immediately appealed. And, the U. S. Court of Appeals for the District of Columbia subsequently vacated FPC's order and remanded the abandonment case for further study.

The abandonment, however, was already in effect and the commission had allocated the gas among Panhandle's customers. The court stated that there was no reason why the gas should not be returned to Michigan pending FPC's final action in the case. However, the court declared it was not equipped to allocate the gas between the competing parties. Therefore, the court vacated FPC's allocation order and remanded that part of the case so the commission could make this determination.

Then, Michigan Consolidated filed a motion with FPC for an interim order directing Panhandle to resume deliveries of the entire 127 MMcf. Panhandle objected. But the FPC held that there was sufficient unused capacity on Panhandle's system to permit resumption of the 100 MMcfd service on a temporary basis.

Interest steps up on Trans-Mediterranean line

A search for the most economical way to bring Sahara natural gas into the West European market is being intensified by France.

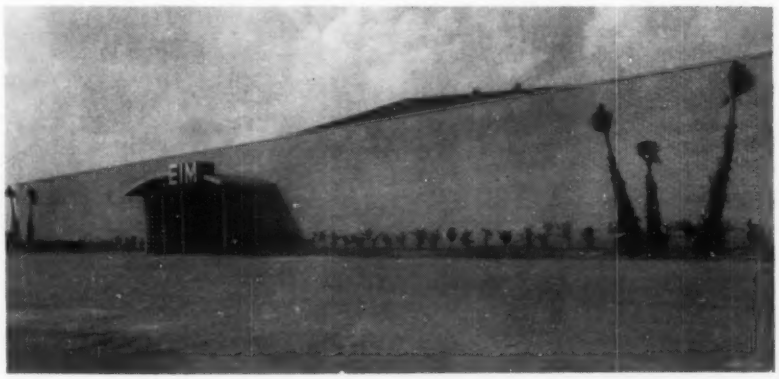
Trans - Mediterranean pipelines are in the offing as well as a fleet of liquid methane tankers. France's gas deposits in Algeria are placed at about 1 trillion cu meters.

Heading market and transport research for methane is Gaz de France, the country's nationalized gas company. One of the company's first projects, together with Electricite de France, has been the laying of an 8.5-in. line into the Mediterranean off the Algerian port of Mostaganem. The sea-trial pipe, coupled together in five sections for testing, stretches out three miles across the Mediterranean floor.

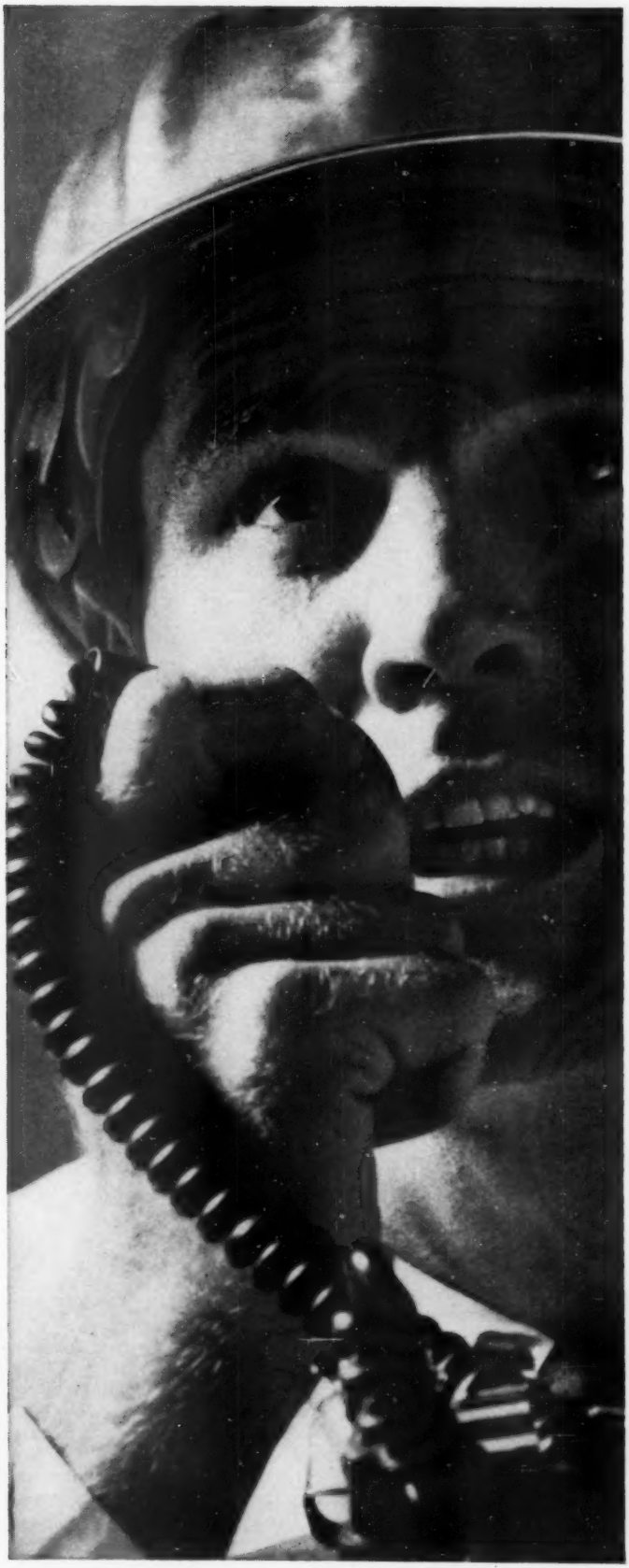
With Gaz de France backing, two new companies have been formed. One is handling methane pipeline studies while the other is surveying the West European energy market for its sales potentialities for Sahara methane.

Two possible pipelines are being given serious consideration. One parts from Mostaganem for Carthgena, Spain, a 125-mile trek at depths to 9000 ft. The other crosses the Gibraltar Straits, a 16-mile stretch with sea depths no greater than 1500 ft.

Preliminary calculations show that about $1 billion would be needed to finance the Mostaganem-Carthgena pipeline and about $800 million for the Gibraltar proposal. However, the Algeria - to - Spain route is more direct and once in operation, transport costs would be less.



E-I-M Co. has moved into its new p'ant in Missouri City, Texas. The half-million-dollar-plus quarters were designed to double the company's manufacturing capacity.



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Texas Eastern plans 150 MMcfd expansion

Texas Eastern Transmission Corp. plans to add about 150 MMcfd to its daily delivery capacity. Present customers of the company will benefit from the increase.

Subject to FPC approval, the increase will come in two increments of 75 MMcfd in 1961 and the remainder in 1962.

The cost of the 150 MMcfd expansion is an estimated $70 million. To pick up the gas in north Louisiana, Texas Eastern would build a pipeline to its main 30-in. line at Kosciusko, Miss.

Construction okayed

FPC authorized Atlantic Seaboard Corp. to spend $1.9 million on new pipeline facilities (Docket G-20091).

Exceptions had been filed by a customer, Lynchburg Gas Co., but they were denied by the FPC.

Construction involves 13.4 miles of 26-in. and 6.4 miles of 20-in. loops in Virginia and Maryland.

New firm specializes in engine maintenance

A commercial chemical laboratory designed for the scientific control of engine maintenance has been established in Oakland, Calif.

Analysts Inc. offers a complete laboratory and consultant service for preventive maintenance of internal combustion engines. The lab is also set up for special research assignments for the petroleum and allied industries.

Saskatchewan buys big gas reserve

Saskatchewan Power Corp. paid $6 million for gas reserves in the Hatton field of southwestern Saskatchewan.

Included in the transaction: 275 sq miles of gas leases, 250 billion cu ft of proved reserves, and 125 billion cu ft of probable reserves.

The price averaged about 2.5 cents per Mcf. Companies selling included Amurex Oil Co., Ashland Oil & Refining Co., Hudson's Bay Oil & Gas Co., Murphy-Canada Oil Co.

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Engineers describe new recovery method

Phillips Petroleum Co. engineers have described a "very promising" method for recovering petroleum products from natural gas. The method is a "new short cycle adsorption" process, "which makes it profitable to treat gas containing as little as 0.1 gal. of liquid per 1 Mcf."

G. H. Dale, D. M. Haskell, H. E. Keeling, and L. A. Warzel, all of Phillips, reported on the process in a paper presented at the 43rd national meeting of the American Institute of Chemical Engineers.

Recent gas field discoveries have been yielding "progressively drier gas" which is leaner in natural gas liquids, they pointed out. "It becomes increasingly difficult to treat gas economically by oil adsorption when the gas contains less than 0.4 to 0.3 gal. of pentane plus liquids per 1 Mcf. The increasing value of natural gas liquids has prompted improved recovery methods."

In describing the short-cycle adsorption unit, the men said . . . "the new chamber design with internally insulated bed makes it practical to heat up and cool down in a matter of minutes. This, then, makes it possible to get good recoveries of low concentration materials using relatively small units. . . . The unit consists of two adsorption towers, a furnace to supply hot stripping gas, a gas pump to circulate the hot gas, and heat exchangers to cool and condense the material stripped from the bed."

The "key to the whole project": An on-stream chromatographic analyzer.

Northern, Permian talk merger

Directors of Northern Natural Gas Co. and Permian Basin Pipeline Co. have given preliminary approval to the planned merger of the two companies. Approval also must come from stockholders of both companies and regulatory and governmental agencies.

At present, Northern owns 93.2 per cent of the common stock and 57.9 per cent of Permian's preferred stock.

Northern's 13,000-mile system serves 500 communities in the Northern Plains area. Permian operates its pipeline system in western Texas and southeastern New Mexico.

Lone Star installs new liquid recovery unit

Construction is under way on a liquid hydrocarbon recovery unit near Madisonville, Texas, according to Lone Star Gas Co.

The unit will improve burning characteristics of natural gas used by customers in the Madisonville area. Liquid hydrocarbons removed from the gas stream will be sold to the Cactus Transport Co.

Capacity of the plant is about 20 MMcfd of gas and 80 bbl of natural gasoline per day.

Algonquin, TET file applications

Texas Eastern Transmission Corp. and Algonquin Gas Transmission Corp. have filed construction plans with FPC involving expenditures of $20 million.

Texas Eastern (Docket CP60-122) plans 66.2-mile, 30-in. loops between Vidor, Texas, and Lambertville, N. J. An additional 33,710 hp will be installed in four existing compressor stations. Cost to Texas Eastern: $17.6 million.

Algonquin (Docket CP60-124) wants to install a 6000-hp compressor station at Stony Point, N. Y. Cost: $2.5 million.

With the new facilities, Texas Eastern will make increased deliveries of up to 51 MMcfd to 17 of its existing customers, including Algonquin. The increase in annual volume is about 15.1 billion cu ft.

Algonquin's new facilities would enable it to deliver an additional 14.8 MMcfd to 10 existing customers. Annual volume increase is over 4 billion cu ft.

Transco to move L. P. gas

Transcontinental Gas Pipe Line Corp. has formed a subsidiary to build and operate a $63 million common carrier pipeline to transport LPG in interstate commerce.

E. Clyde McGraw, Transco president, said that Trans-Southern Pipeline Corp. is expected to be in operation by November 1961. It will have an initial daily capacity of 60,000 bbl of L. P. gas. Maximum diameter of the proposed system will be 12 in. It will move the fuel from the Gulf Coast into the Southeastern states, originating at Mont Belvieu, Texas, and extending 1080 miles to Danville, Va.

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W. J. WOOTEN has been elected vice president and manager of exploration for Texas Gas Exploration Corp., Houston. He was formerly manager of the company's land department.

MONTY G. MARTIN is manager, gas reserves, for Texas Gas Transmission Corp., Houston. Martin was formerly chief geologist.

D. E. KILLAM JR. has been appointed manager, land department, for Texas Gas Exploration Corp., Houston. The former district landman at Lafayette, La., will supervise drilling agreements and the acquisition and maintenance of the company's gas and oil leases.

Northern Natural Gas Co., Omaha, has reorganized its operating division into six area offices. Vice President A. L. VAUGHAN was named to head the newly established operating division, and Vice President W. B. HAAS was placed in charge of the newly created construction and engineering division. New area locations and the men named as area managers are: DAVID P. CORKILL, Minneapolis; EVAN M. GRIFFITHS, Des Moines; ROSS N. VOX, Lincoln, Neb.; OTTO V. BARBEE, Great Bend, Kan.; CARL W. IKARD, Liberal, Kan.; and JACK SEAMAN, Midland, Texas. Working directly under Vaughan is GLEN GROVE as manager of administrative control. He controls and coordinates the activities of the six area offices.

M. J. HELMICH has succeeded W. R. CROOKS as chief engineer of Cooper-Bessemer Corp.'s development division. Replacing Helmich as assistant chief development engineer is G. A. DORTON. Crooks, retiring after more than a quarter century in the heavy duty diesel and gas engine development field, continues his association with Cooper-Bessemer in the capacity of development consultant.

Several appointments have been announced by Natural Gas Pipeline Co. of America and associates. M. L. DECRAENE is assistant general superintendent of pipelines; H. E. BOOMER is administrative assistant to the president; T. H. BEALS is chief planning engineer; and R. W. LINDGREN is superintendent of development engineering, a newly created post.

ARTHUR H. OESTERHELD has been named manager of systems and procedures for Texas Gas Transmission Corp., Owensboro, Ky. Before joining Texas Gas, Oesterheld was assistant comptroller for the New Haven Railroad.

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Northern Natural Gas Co., Omaha, has formed a new company, Northern Propane Gas Co. and appointed P. A. GASS as president. Gass is also a senior vice president of the parent company. Other officers of the new subsidiary, who are also officers of the parent company, include JOHN F. MERRIAM, chairman of the board; H. H. SIERT, treasurer; and B. H. HARPER, secretary. R. K. ALBON has joined as vice president.

ROLLAND E. SANDERS JR. has joined Service Recorder Co., Cleveland, as chief engineer. He will have a key role in diversification and development of new products and will be responsible for the research and engineering side of production.

Midwest Piping Co.'s new Pittsburgh sales office is the charge of WILLIAM M. BUSHMAN. Territory covered by the office includes the Pittsburgh area, western Pennsylvania, West Virginia, and southeastern Ohio.

JOHN W. JENNINGS, formerly application engineer in Houston for Clark Bros. Co., has been promoted to sales representative, small engines, for the same district. JOHN L. SPENCER is now application engineer in the Houston district office. And, JAMES O. CAMPBELL, formerly application engineer, Turbo marketing department in Olean, has transferred to the Los Angeles district office as application engineer.

ROBERT J. COOK has been named supervisor of pipeline sales for Union Switch & Signal, division of Westinghouse Air Brake Co., Pittsburgh. Prior to the appointment, Cook was area manager for the midwestern area. DANIEL N. ROWSWELL JR. has joined the division of sales engineer. Most recently, Rowswell was a project engineer for Koppers Co.

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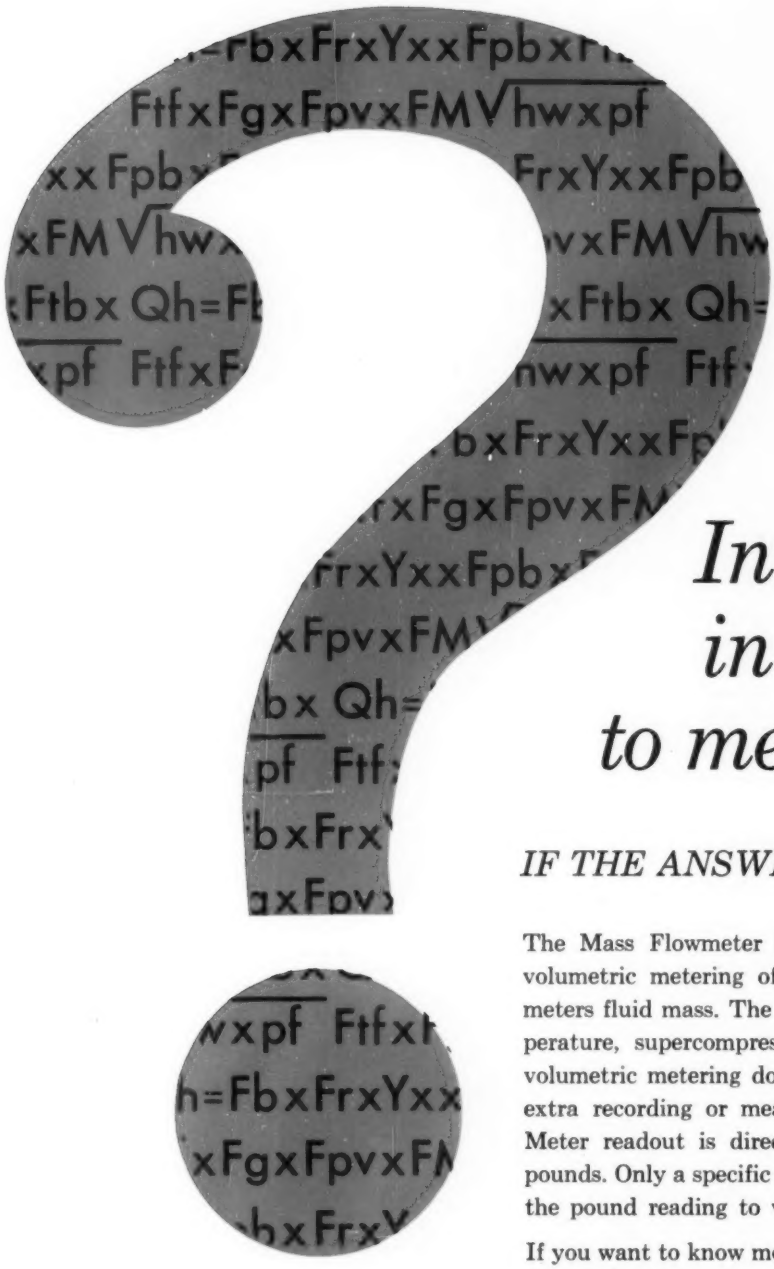
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